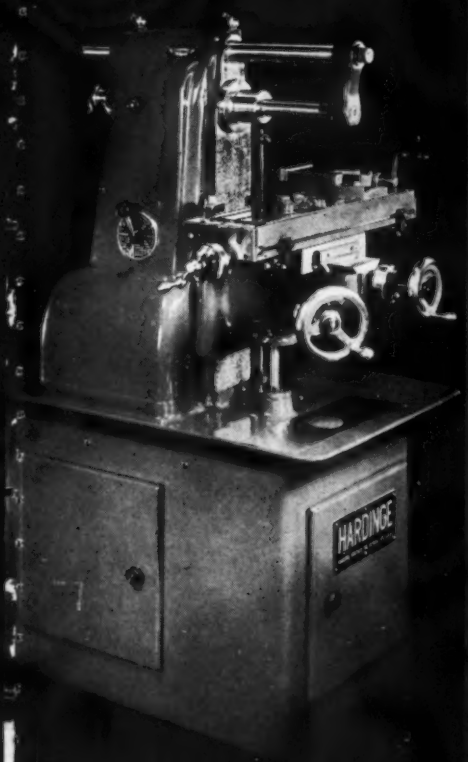
MACHINE TOOL BlueBook

SEPTEMBER 1941



HARDINGE

HIGH SPEED PRECISION MILLING MACHINE

SPECIFICATIONS

Table 28" x 8" with micrometer controlled travel of 14" longitudinal, 8" transverse and 13" vertical. Cutter headstock and index head take standard ½" capacity collets. Spindle speeds 150 to 1250 R.P.M.

The Proper Size for....

the majority of milling operations in the tool room.

The present demand for efficient production is showing the definite need for this milling machine to take many jobs away from larger milling machines which are expensive and cumbersome to operate.

Available with plain or universal spiral index centers, vises, arbors, collets, power feed and vertical attachment.

Ask for bulletin TM

HARDINGE BROTHERS
INC.
ELMIRA, N. Y.

At the Craine - Schrage Steel Company, as in modern plants everywhere, you'll find the

Hack Saws are MARVELS

Add this Detroit plant to the long list of leading steel companies, forge shops and industrials that have standardized on MARVEL Metal-sawing Equipment. In this plant you will find: a MARVEL No. 18 Saw, MARVEL No. 9A and No. 6A Heavy-duty High Speed Saws, and a MARVEL No. 8 Band Saw. So it is in modern plants in all parts of the country—MARVEL Sawing Machines predominate.

Whatever your metal sawing problem, whether cutting-off from bar stock or large billets, there are MARVEL Saws exactly suited to your needs. Your local MARVEL Sawing Engineer will gladly study your metal-cutting problems and recommend the most suitable methods and equipment to speed up your production.

ARMSTRONG-BLUM MFG. CO. *"The Hack Saw People"*

5700 Bloomingdale Ave., Chicago, U. S. A. **Eastern Sales: 225 Lafayette St., N, Y.**

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"It was like adding 3 EXTRA WELDERS when we got our HOBART. We use it THREE SHIFTS DAILY!"

Save time—save money! Get better quality welds in these high speed production days when it's doubly costly to experiment with inadequate equipment. Delays are expensive, rejects costly. Hobart Arc Welders are meeting just such conditions every day in hundreds of the nation's leading industries. Get more profit, complete important schedules faster with a Hobart! Use coupon for details.

REMOTE CONTROL *Found Only In A HOBART* quickly adjusts welding heat at the work, eliminates waste time and extra manpower.

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HOBART Welding Rods

—for tank, boiler, shipbuilding, pipe, machinery or construction welding. Ask for handbook EW-48 for full details.

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USE THIS COUPON!

THE FASTEST SELLING ARC WELDERS ON THE MARKET TODAY!

Spring tempered COLLETS

Order From Stock

Scientifically heat treated to a true spring temper, "Rivett Mark" collets resist wear and hold their spring longer than collets of any other make. As standard equipment on all makes of lathes and millers, (see Rivett Bulletin 1008) they may be ordered for immediate delivery from the following stocks:—

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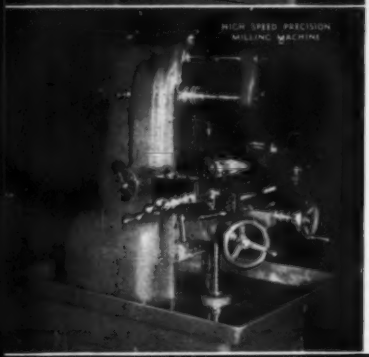
HARDINGE



WORTH REMEMBERING

(No. 1 OF A SERIES)

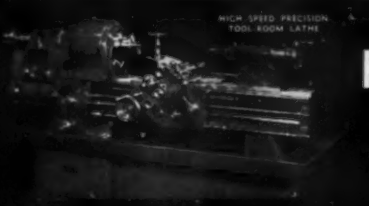
Today's extremely close tolerances and the require ment for high speed production have shown the rea value of Hardinge High Speed Precision Machine Tools

The use of the machines illustrated has expanded tremendously because of their ability to do, BETTER and FASTER, the work which was formerly done with larger machines.

Efficiency is essential in the present emergency be cause of needed production, but isn't it true, when costs and results are considered, that efficiency in machining operations is always important?

Many organizations were acquainted with the features of the Hardinge High Speed Precision Machine Tool and many were not. But, most organizations NOW realize the logic of using the proper size machine in relation to the work.

For the future, make certain that your range of pro duction work is always efficiently manufactured—such a plan should incorporate Hardinge High Speed Pre cision Machine Tools.

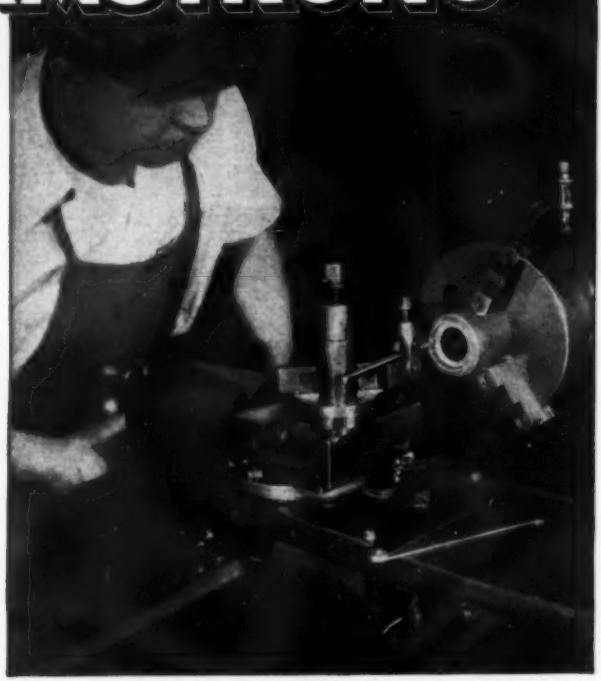


HARDINGE BROTHERS, INC

ELMIRA, N. Y.

Performance has established leadership for Hardinge

ARMSTRONG



This ARMSTRONG BORING TOOL HOLDER is designed for small diameter work

The lightest of the 4 boring and inside threading tools in the Armstrong System of Tool Holders. It is an extremely handy tool, for small diameter boring, threading, brass turning and other light, accurate work, because (1st) while it has an offset shank, it is at the same time reversible—can be used as right hand or left hand tool, as desired, by simply swinging the yoke over the end of the shank. As either a right or left hand tool, these tool holders take small diameter bars (from 3/16" up) or standard square cutter bits. A floating gib (patented) in the yoke gives an extremely wide bearing on bar or cutter, increases rigidity and prevents chattering. The Boring Bars are of the best high speed steel, properly hardened, tempered and ground, ready for use. Each ARMSTRONG Light Boring Tool Holder comes with two High Speed Boring Bars, one High Speed Cutter and a drop forged Wrench—ready for work. 5 sizes of bars from 3/16" to 7/16". For heavier work, check the heavier boring tools described in the ARMSTRONG C-39 Catalog.

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"THE TOOL HOLDER PEOPLE"

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Eastern Warehouse & Sales: 199 Lafayette St., New York, N. Y.

ARMSTRONG TOOL HOLDERS Are Used in Over 75% of the Machine Tools and Tool Rooms

Machine Tool Blue Book

Hitchcock Publishing Co., 508 So. Dearborn St., Chicago

32,500 This Issue *Volume 37, No. 9*

SEPTEMBER 1941

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CCA

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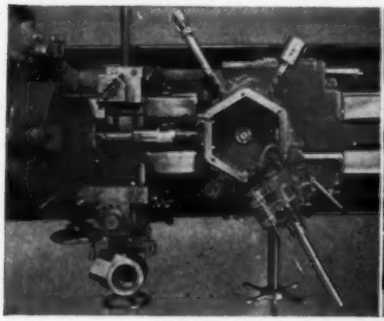
Type HD 1836 Electric Carburizer in the Roanoke, Virginia shops of the Norfolk & Western Railway.

N & W *and* HEVI DUTY *furnaces*

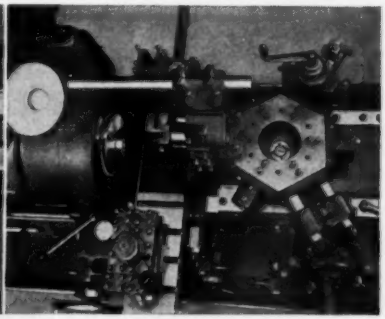
Among important Hevi Duty Electric Furnaces in the Roanoke Shops of the Norfolk & Western Railway is the Hevi Duty Electric Carburizer used for carburizing pins and bushings in car construction. Quality and economy were important factors considered in their choice of this equipment.

HEVI DUTY ELECTRIC COMPANY

IT'S NOT TOO SOON TO THINK OF THIS



Machining the breechblock of a gun on a Jones & Lamson 8A Saddle Type Universal Turret Lathe



Machining a bronze pump impeller on a No. 5 Jones & Lamson Ram Type Universal Turret Lathe

PROFIT PRODUCING MACHINE TOOLS

Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers.

THE tramp of armed men sounds louder day by day, and louder and louder must rise the roar of production from the shops to which America looks for planes and tanks and trucks and arms and ammunition. To meet this need and meet it quickly, wise management makes immediate use of versatile, high speed, standard Jones & Lamson equipment.

With all its skill and speed for armament, wise management also knows **it's not too soon to think of the future** — of the day when the salesman will follow the soldier — and post-war competition will be in full blast. Against that time wise management chooses cost-cutting Jones & Lamson equipment that not only speeds defense but protects future profits.

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with the Copperspun Rotor

for "ALL OUT" Production

There's no motor so capable of operating dependably under the most severe plugging and reversing service as the Fairbanks-Morse Motor with one-piece rotor winding centrifugally cast of SOLID COPPER.

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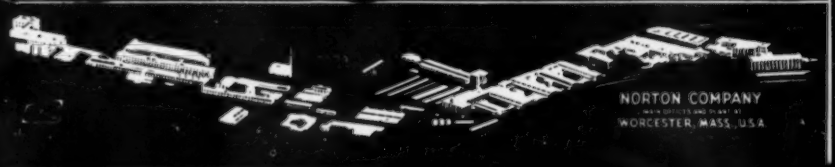
Hitting on HIGH!

IN 1920 Norton built the first tunnel kiln in the abrasive industry, three more in 1928, 1936 and 1937. The fifth, just completed, will be fired this month.

The greatly increased kiln capacity and additional manufacturing facilities were ready in time to help meet the increasing grinding wheel demands of the defense industries.

NORTON ABRASIVES



NORTON COMPANY
WORCESTER, MASS., U.S.A.

GRAND RAPIDS

Combination Tap and Drill Grinder

TAP GRINDING—

Tests have proven that taps ground on a Grand Rapids will cut with less than half the power required for hand ground taps and will stay sharp several times as long, even when hand grinding is done by the best mechanics.

DRILL GRINDING—

For grinding taper or straight shank drills, and drills with enlarged shank or sockets. You can grind small drills and then large drills, straight and then taper shank drills with one simple adjustment of the tailstock.

No. 10-B

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405 STRAIGHT AVE., S.W., GRAND RAPIDS, MICH.

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AIRCRAFT PARTS

whose production can be accelerated on the U. S. Multi-Miller

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Rod End Clevis
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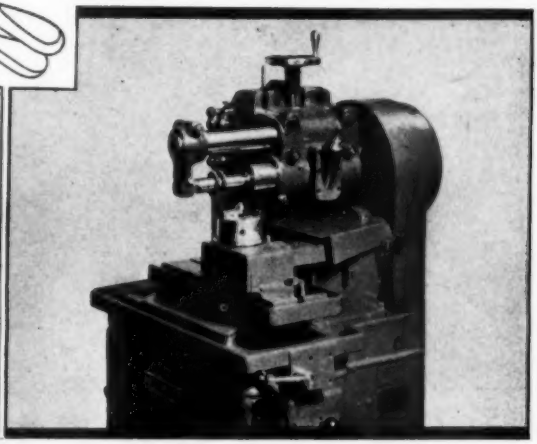

Here is a milling machine designed to meet the expanding requirements of the aircraft industry—fully automatic in operation—precision built to turn out precision work—low changeover time.

Multi-Miller versatility is illustrated by the variety of out-of-the-ordinary applications, such as cutting off, spur gear cutting, contour milling, grinding, step milling, rotary milling and continuous milling, performed on these machines, in addition to conventional milling operations. Then, too, the Multi-Miller can be used for hand milling as well as for these automatic operations.

An example of Multi-Miller production of an aircraft part is the tough steel (SAE 2330) turnbuckle fork illustrated above. A 180° index table holding two fixtures enables the operator to load during the cutting cycle. Production is 125 per hour.

Let us demonstrate Multi-Miller economies on your parts.

PRODUCTS

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AMPERE (EAST ORANGE) N. J., U.S.A.

MAKERS OF
U. S. MULTI-MILLERS
U. S. MULTI-SLIDE MACHINES
U. S. AUTOMATIC PRESSROOM EQUIPMENT—U. S. COMPOUND WHEEL TRUING ATTACHMENT
U. S. DIE SETS

AMMCO 6" SHAPER

"A precision machine of a thousand uses"

- - IT'S PORTABLE - -

Saves Steps and Time

Don't tie up a big shaper when so many jobs can be done just as accurately and much quicker on AMMCO 6" PRECISION SHAPER . . . Available for stationary installation or mounted on portable cabinet easily rolled to the mechanic's workbench.

Features of this Shaper include quick adjustment of stroke, ram position, tool head, table height, table support, feed and speed . . . The maximum length of stroke is 7¼" . . . Table has five cross feeds (reversible) . . . Countershaft has three-step cone pulley . . . ¼ or ⅓ H.P. Motor.

Manufactured by an organization having years of experience in producing precision machinery . . . Recommended by leading machine tool dealers and machine tool manufacturers.

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AUTOMOTIVE MAINTENANCE MACHINERY CO.

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Faster, Accurate Tapping —Greatly Reduced Tap Breakage

Made Possible by Sensitivity of Procunier Tapping Head—and Smooth Velvet-Like Action of the Clutch

A prominent Ohio manufacturer writes: "On checking with our factory, I find the *Procunier High Speed Tapping Head with the Tru-Grip Tap Holder* is very satisfactory. It not only eliminates the necessity for using extension taps, which are more or less expensive, but it reduces tap breakage . . . and enables our workmen to produce more and better work . . . we are now able to discard our taps due to wear, rather than breakage." Some of the reasons back of this letter and hundreds of similar letters from enthusiastic users are: Tru-Grip tap holders weigh less than ⅓ the weight of conventional tap holders, and are more compact and accurate. Only Procunier High Speed Tapping Heads offer all these features: Dry, double-cone friction clutch that won't wear and can't absorb oil; makes bottom tapping easy; ball bearings; three point balanced, heat-treated gear reversing mechanism, which distributes pull and and greatly reduces strain — and other important features.

SEND FOR BULLETIN

giving full details, description and prices on complete line of Procunier Precision Tapping Heads to meet all needs, the new Tru-Grip Tap Holder—and also the full line of Procunier Universal Tapping Machines, hand, foot or air operated.

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Send me Bulletins on: ☐ *High Speed Tapping Heads* ☐ *Tru-Grip Tap Holders* ☐ *Universal Tapping Machines.*

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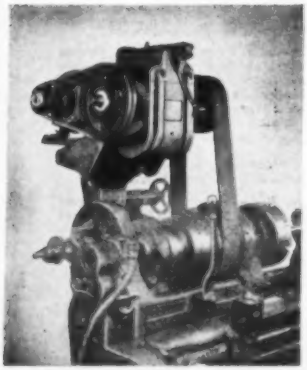
PROCUNIER
SAFETY CHUCK CO. 14 S. Clinton St. Chicago, Illinois

"IF YOU WANT MORE PRODUCTION-"



HERE IS WHAT TORQ-QUA-MATIC DRIVES CAN DO FOR YOU . . .

Case histories show that TORQ-QUA-MATIC TRANSMISSIONS can increase the efficiency of lathes, shapers, milling machines—by as much as 25%; delivering more horsepower *at the point of work*. They permit more rapid speed changes. The conveniently located speed selector cuts waste "reaching" motion by 50%. On a hand screw machine this saving amounts to 14,400 operator motion feet per day—motions that with TORQ-QUA-MATIC TRANSMISSIONS can be converted into greater production.

Complete details and specifications are available in "TORQ-QUA-MATIC INSTALLATIONS"—a copy is yours for the asking. Send for your copy NOW!

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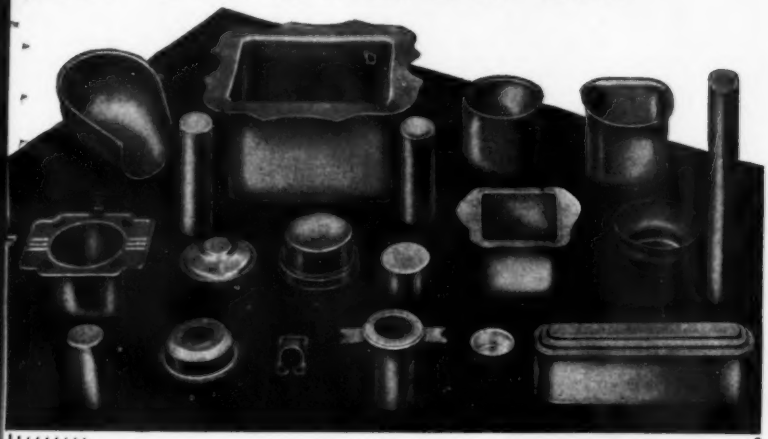

Many manufacturers have found that Dayton Rogers Pneumatic Die Cushions can produce drawn parts on both contract and quantity production basis much more economically and advantageously than they can be turned out by the use of springs or rubber bumpers.

The photograph shows characteristic deep drawn parts including various drawn shells, such as: relay box covers, instrument cases, broadcasting tubes, automatic pencils, automotive carburetor parts, bath trays and various other drawn articles which can be produced to an advantage by using Dayton Rogers Pneumatic Die Cushions.

The Dayton Rogers Mfg. Co. is at all times in a position to make definite recommendations as to the best type and size cushion suitable for your requirements.

WRITE FOR COMPLETE ENGINEERING CATALOG OF REPRESENTATIVE INSTALLATIONS OF THE PNEUMATIC DIE CUSHIONS ON ALL DEEP DRAWING AND PRESSURE PAD CONTROL WORK.

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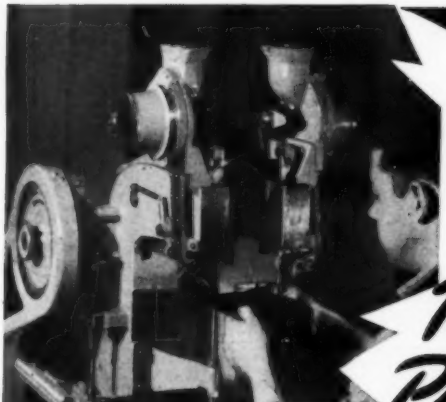

HOW TO *Double* YOUR *Riveting Production!*

It's simple as A B C. Set two rivets—or three—or four at once, and up goes your production automatically! Model 55 (illustrated) sets two rivets at once and has adjustable centers which are *easily* and quickly *set*. Other Multiple Rivet Setters in the Chicago Line set three and four rivets at a time... There's a wide range of types and sizes for practically any riveting problem.

Write for Special Automatic Rivet Setter Bulletin or submit blueprint or sample assembly for specific recommendations.

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9610 West Jackson Boulevard, Bellwood, Illinois (Chicago Suburb)

Tubular and Split Rivets in All Rivet Metals

Automatic and Manual Rivet-Setters for 1 to 4 Rivets at a Stroke

30 TO 1
you'll be money ahead!

DO YOU perform *any* light or heavy duty grinding operations in your plant? Any polishing or wirebrushing or filing or sanding? *One* of the *30 different types* of Haskins Flexible Shaft Equipment will do it so much *better*—so much *faster*—so much *longer*—that you're sure to be money ahead.

Whether the mounting is bench, truck, pedestal or ceiling-suspended—whether the motor rating is ¼ or 1½ HP—whether the drive is direct or multi-speed countershaft—your Haskins Flexible Shaft Equipment is built to the highest standards of speed, precision and dependability. Get *all* the money-saving facts. Write for Catalog No. 45, giving full details about this *really complete* line and illustrating many interesting applications. R. G. Haskins Company, 623 S. California Avenue, Chicago.

HASKINS

HASKINS FLEXIBLE SHAFT EQUIPMENT TYPE H-4, a light weight, sturdy, all-purpose tool. ¼ HP, ball bearing motor with 4-speed (up to 4650 RPM) Timken bearing countershaft. Bench plate mounting, 360° ball bearing swivel.

HASKINS FLEXIBLE SHAFT EQUIPMENT TYPE CH-4, for either fixed or trolley overhead suspension. ½ HP, ball bearing, air jacket motor with 6-speed (up to 7500 RPM) Timken bearing countershaft. Full ball bearing spindle adapted to use true running taper shanks.

HASKINS

FLEXIBLE SHAFT EQUIPMENT

MARSHALLTOWN PRESSES

(Illustration No. 5 Flywheel Type)

The *Most* FOR YOUR MONEY

★

BETTER PRODUCTION

★

LONGER LIFE

Marshalltown Presses are engineered and built to give the utmost in dependable, trouble-free service. Features of design include more die space, chrome nickel cranks, wrist pin connections and many other proven advantages. Available in capacity of 5 to 70 tons—each one an outstanding value.

Write today for literature about Marshalltown Presses—available in capacities from 5 to 70 tons.

MARSHALLTOWN MFG. CO.

900 E. NEVADA ST., MARSHALLTOWN, IOWA

Machines you should know about

BROACHING PAYS IN JOB LOTS

Number 4

The

"JUNIOR"

ON THE JUNIOR—a low cost bench press all-hydraulic in operation—you can perform all kinds of miscellaneous operations—broaching, assembly, light straightening, etc.—in job lots or continuously

It is the sort of machine that is spelling the difference between a headache and a profit on numerous fussy little jobs.

For the money involved you can't go wrong—and you don't have to wait 18 months to get one (or a dozen) either

We will be glad to send you a specifications sheet and prices *Just drop us a line.*

The

"SENIOR"

WHERE YOU WANT TO cut production costs—or if you just don't want to wait 12 to 18 months for milling machines—this Senior Press by Colonial will do many a "milling," "boring," or "reaming" job faster, cheaper and more accurately—by broaching.

It is the kind of machine that—when the present furore is over—you will be glad to have in your shop; to make profits when the going is tougher.

We'll be glad to tell you how many of your present or proposed jobs can be handled on this machine. Send us blueprints or ask us to have a field engineer stop in.

If you just want specifications, now, ask for Bulletin No. VBS-40.

COLONIAL BROACH COMPANY

147 Jos. Campau Street Detroit, U. S. A.

The EASE of Control of Buffalo Drills means plenty these days!

Whether they are handling the tough assignments of the production line, or the precision work of the tool room, Buffalo Drills get more done—and faster—thanks to their exceptional ease of control.

Just ask any operator! Controls are handily placed—just where they should be for minimum arm work. What's more, the easy adjustment of sliding heads and tables means minimum set-up time.

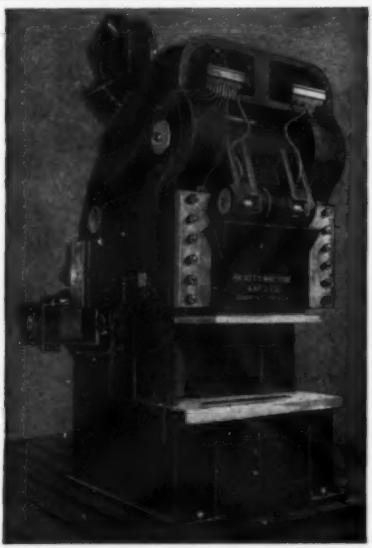
Add these features to the rugged, practical construction of Buffalo Drills and the long-term accurate performance, and you'll quickly see why "Buffalo" is contributing so much these days to Industry's defense program.

There's a Buffalo Drill to fit practically every industrial requirement. Just tell us the type of drilling—and we'll send you descriptive Bulletins.

BUFFALO FORGE COMPANY

161 Mortimer Street, Buffalo, New York

"Buffalo" **DRILLING MACHINES**



No. 16 TOGGLE PUNCH PRESS

The No. 16 TOGGLE with large die space is suitable for punching and shearing tie plates, punching and straightening splice bars, also for general manufacturing press, punching and shearing articles. Drive is mounted inside of frame.

The Press is equipped with magnetic or air clutch. This is a high speed heavy duty Press for many applications.

GENERAL DIMENSIONS:

	No. 16	No. 16A	No. 16B
Face of slide, right to left	43'	53'	62'
Face of slide, front to back	24'	26'	26'
Die space, slide down	20'	20'	20'
Stroke; Standard	3'	3'	3'
Maximum	5'	5'	5'
Face of table, right to left	53'	60'	66'
Face of table, front to back	24'	26'	26'
Capacity	700T	850T	1000T
Strokes	40	35	30
Depth of throat	15½'	15½'	15½'
Weight	76,000	82,000	88,000 lb.
Motor required Horse Power	20	30	40

BEATTY MACHINE & MANUFACTURING CO.

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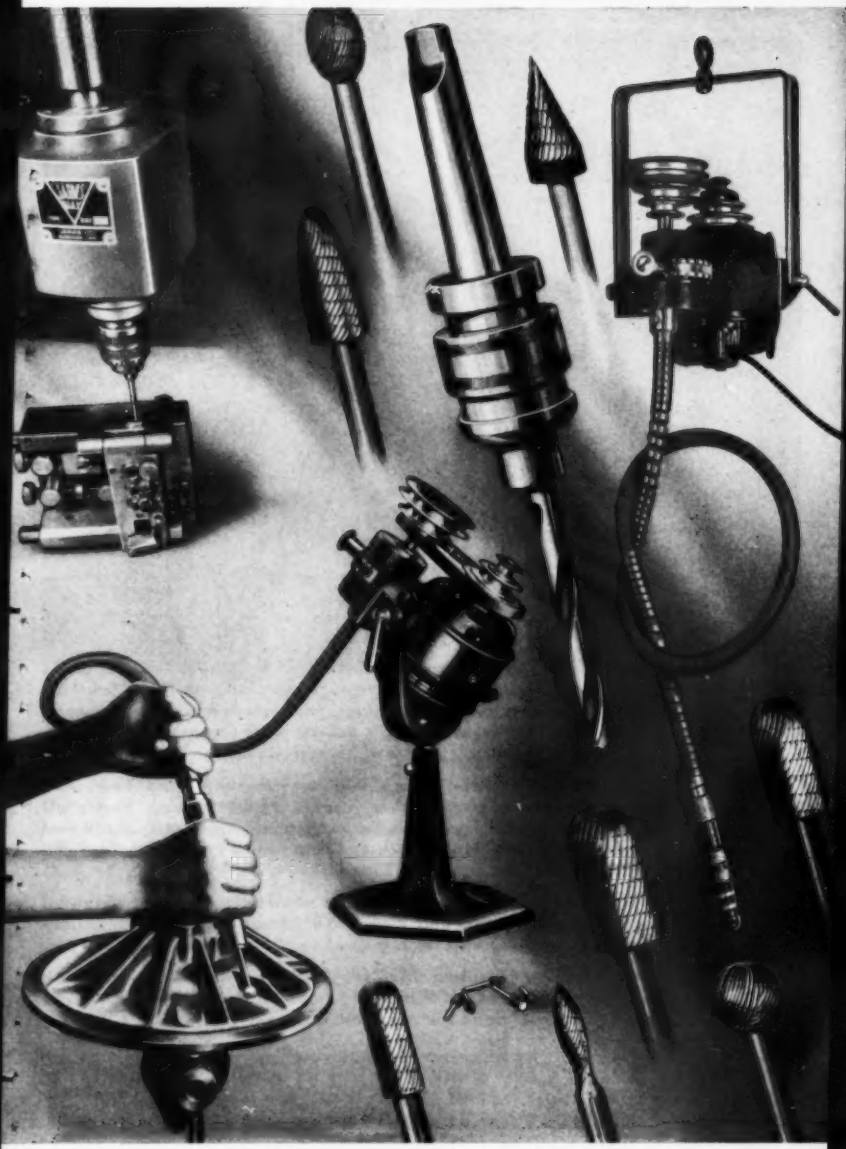

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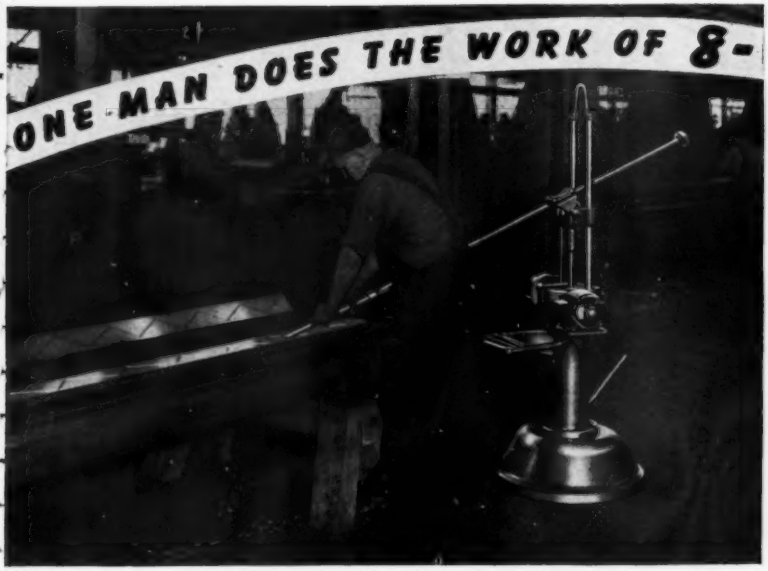

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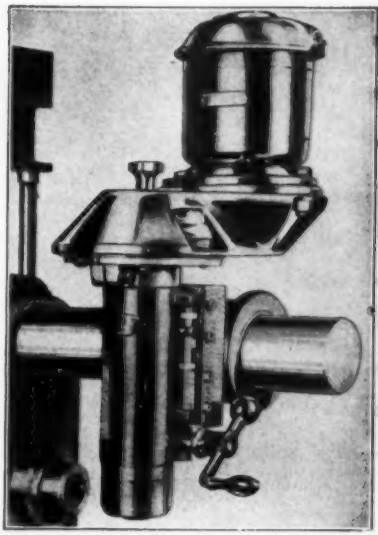

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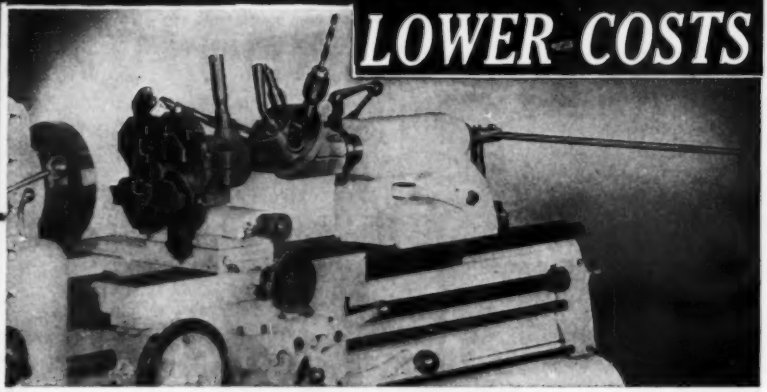

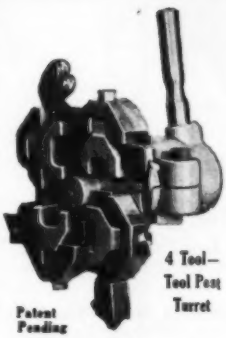

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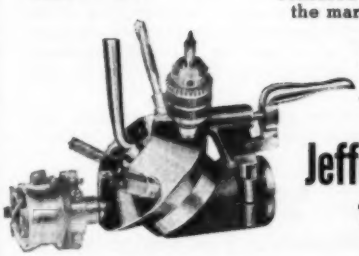

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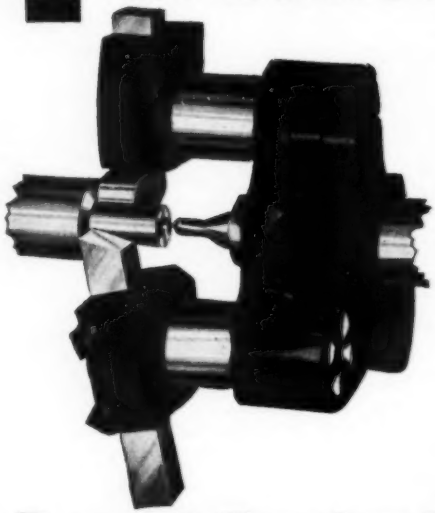

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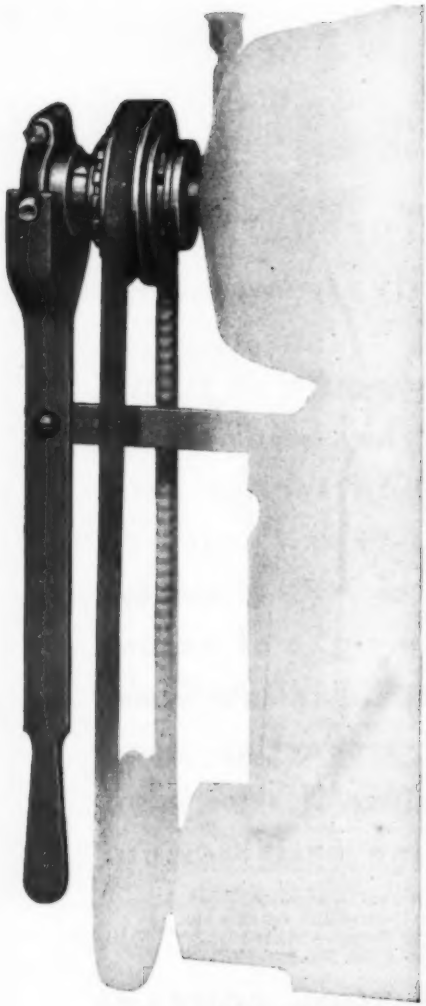

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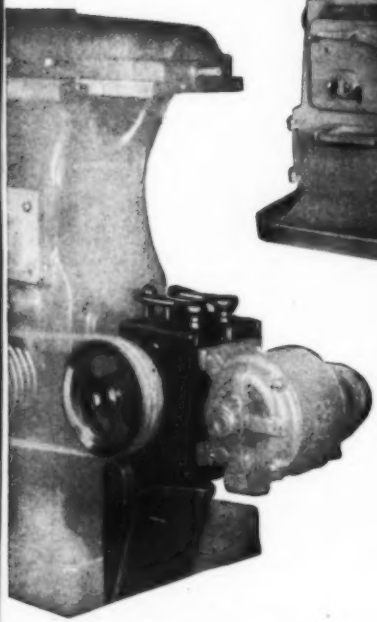

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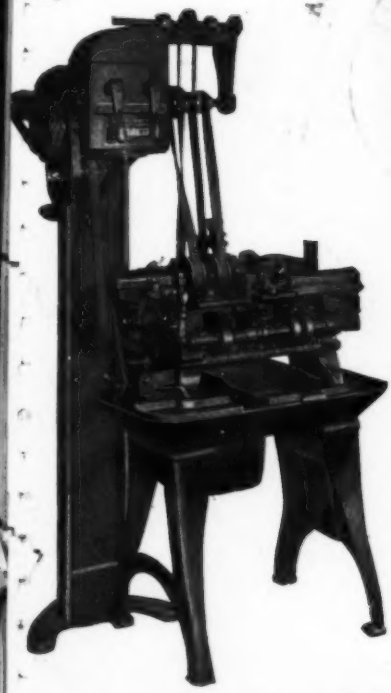

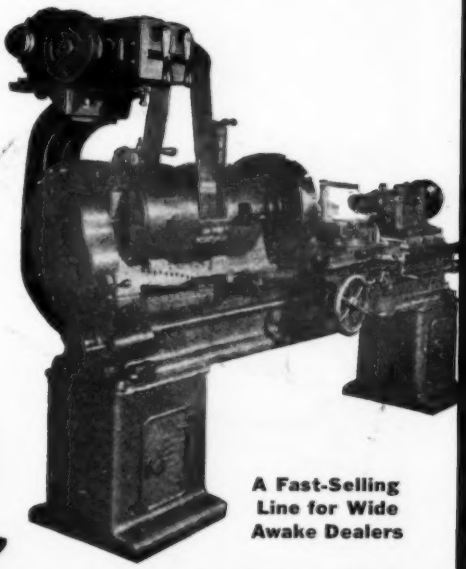

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The Editor's Page

IN a Democracy you'll always find differences of opinion on national questions—which is as it should be. But it's a foregone conclusion that most of our citizens are loyally in accord with measures that are being taken for Defense. Certainly, no true American could object to taking this pledge for National Defense suggested by Hubert M. Harrison of the East Texas Chamber of Commerce:

"I will keep myself fit physically, mentally, spiritually—to be ready for any crisis, and to discipline myself for strength.

"I will go about my business with a clear eye, a cool head and a stout heart, neither scared by wild rumors nor deluded by false security.

"I will do my particular job—in office, store, shop, mill or farm—better than it was ever done before, dedicating my skill to my country's service.

"I will take an active interest in government—in town, school district, county, state and nation—and make it my business to understand public affairs, laws and policies.

"I will help build my town as a wholesome, balanced community, because if all the communities are sound, America will be sound.

"I will vote in every election, appreciating the right of the ballot now denied in many lands.

"I will support billions for defense but not one cent for waste.

"I will work for unity among all our people and oppose efforts to create hatred based on race, creed or color.

"I will encourage our boys and girls to revere and respect our American traditions.

"I will keep faith with myself, my country and my God."

Wesley G. Paulson

● Ninety-nine years means very little! Ninety-nine years of highly specialized experience in the steel business means a great deal; especially when that experience has involved handling huge quantities of steel, in thousands of kinds, shapes and sizes, and serving the varied needs of a host of users in every industry.

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We are glad to be 99! We are grateful for the past loyalty of our customers—but more grateful, perhaps, for their cooperation now, in our effort to serve them to the full limit of our resources. Joseph T. Ryerson & Son, Inc. Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

Production Engineering in the Defense Program

By M. L. HUTCHENS

IT is important in this crisis that a standard milling machine can, with a comparatively small amount of special equipment, be made into a high production unit. Since the standard machines are already designed and tooled for, they are available at regular production schedules. A standard milling machine can, therefore, be adapted to a special job by designing a suitable fixture or attachment. Thus, it is possible to get into production on defense work with greater speed than would otherwise be possible. There are some inescapable instances where special machines must be used, due to the design of the workpiece or nature of the cut. The number of these special machines is, however, kept to a minimum.

As an instance of a standard machine transformed into a special purpose tool with the addition of a suitable fixture, the milling of forged aluminum impellers for airplane motor superchargers will be described. A picture of this impeller is shown in Fig. 1. Three milling operations were required and each presented an unusual problem. These three operations are: —(1) Milling top of vanes; (2) Milling

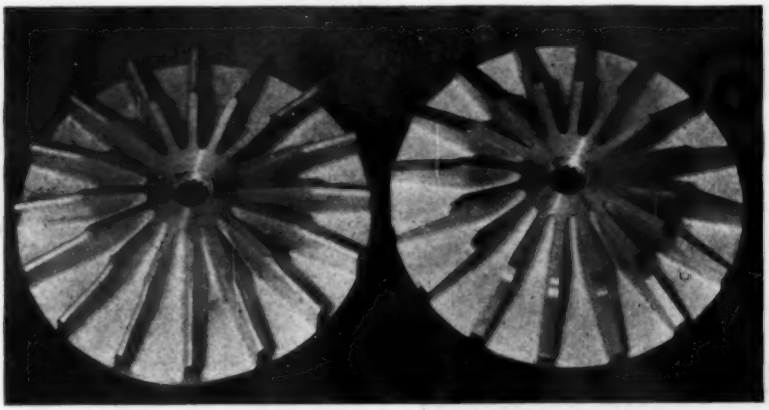

Fig. 1—Airplane supercharger impeller before and after first milling operation, milling tops of vanes.

Fig. 2—General view of machine and fixture for first operation, showing drive mechanism.

sides of vanes; and (3) Milling bottom between vanes .

For each operation, a completely standard No. 2H plain horizontal milling machine is used. This machine has a speed range of 35 - 1400 r.p.m. and a feed range of 1½" - 60" per minute. Special cam reciprocated fixtures with a 16-station automatic indexing arrangement are used for each operation. The stroke, that is length of cut, must be held to close limits and, therefore, a cam reciprocated arrangement is particularly adaptable. The standard machine is equipped with an auxiliary shaft running parallel to the table screw and at the same speed. This speed can be regulated by the feed change mechanism. The drive for the fixture is taken from this auxiliary shaft into a standard drive bracket and then to the top of the table and to the fixture. This drive mechanism is shown in Fig. 2.

The first operation, that of milling the top of the vane, is the simplest of the three to perform. The fixture for this operation is shown in Fig. 3. The surface to be milled is at a 15° angle to the bottom surface of the impeller and, therefore, it is necessary to tilt the holding plate and index ring to this angle. The workpiece is located from splines broached in the bore of the impeller. These splines are located with respect to the vanes at the broaching operation, thus radial location at milling is simple.

Climb cutting is used throughout all operations. This method eliminates the necessity of using a heavy downward clamp which would tend to distort the workpiece. The center splined stud is sawed through two ways and tapered thumb screw used to expand these sawed sections to hold the piece rigidly. The impeller is supported at

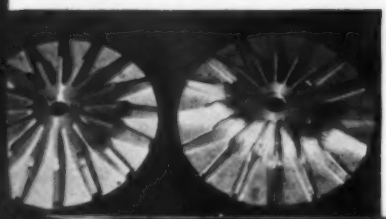

Fig. 3 (Above)—Closeup of fixture showing clamping cam. Fig. 4 (lower left)—Impeller before and after second operation, straddle-milling vanes.

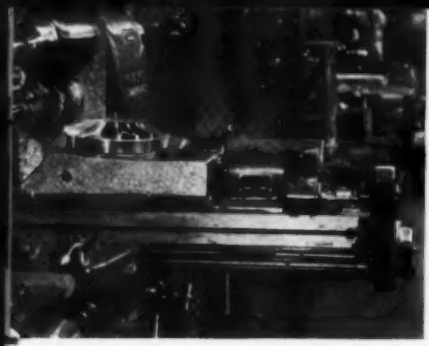

Fig. 5—General view of machine and fixture for second operation.

the outer diameter by a hardened steel ring to prevent springing while under cut.

The cutter is a 2.150" diameter high-speed steel, straight gashed tooth, slab mill with a 1" diameter hole. It is operated at a speed of 1400 r.p.m. or 788 surface feet per minute. This equipment produces a smooth finish and eliminates all chatter.

Indexing is accomplished from an ingenious positive interlocked plunger and pawl arrangement on the return stroke of the reciprocating slide. The feed and return stroke are at the same rate. Thus indexing is simpler than if a rapid return were used, since more time is available for the pawls and plungers to locate properly. On the cutting stroke after indexing, a circular clamp automatically locks the workholding plate and indexing mechanism. This is done by the bar cam which can be seen in Fig. 9. As the slide moves forward, a rocker arm rides over this cam and through a rack and gear segment pinches the ends of a circular clamp together. This clamping action adds greatly to the rigidity of the set-up and helps obtain a smooth finish.

The sliding portion of the fixture moves upon dove-tailed ways with positive taper gib adjustment. Adjustment for wear is simple and the proper frictional force can be adjusted to eliminate chatter.

The fixture for the second operation, that of straddle milling the sides of the vanes, is essentially the same as the one already described. The indexing mechanism and work holding plate are at an angle of 4° to the horizontal in this fixture, instead of 15° as in the previous instance.

The cutters are 5" diameter high speed steel of unground profile and eccentric relief, with a special form to provide for the proper fillet radius and a 1°-11′ angularity from top to bottom of vane. Since stock is removed from the sides of the vane, and also from the bottom radius, the cutters are a combination of side milling and slotting cutters. The number of teeth is kept to a minimum to provide more chip clearance. Teeth are ground on the face and at a slight angle to provide a shearing action under cut. An extremely smooth finish is obtained in one cut. Indexing accuracy is within .001".

The cutters are operated at a speed

Fig. 6—Closeup of fixture for straddle-milling operation showing special form cutters.

of 620 r.p.m. The chip load per tooth is .0018" and production is 5 pieces per hour.

The fixture for the third operation is the most intricate and interesting of all. It is necessary to make a number of passes under a narrow cutter in order to remove all of the stock between vanes. Hence, the fixture must be automatic in order to obtain the proper production and to eliminate the element of human error.

Close examination of the workpiece discloses that to remove this stock, the workpiece must be indexed about its central axis, but must be "inched" about a point which is the center of the radius between successive vanes at the hub. Both of these movements are incorporated in a reciprocating slide by a positive interlock between the indexing and inching mechanisms.

When a cut is started, the slide moves forward and carries the workpiece under the cutter. On the return stroke, a barrel cam located in the base of the slide is rotated slightly by a ratchet arrangement. The ratchet is actuated by the bar cam shown in Fig. 9. This inches the workpiece about its offset center 1/15 of the peripheral distance between the vanes. After 15 cutting strokes have been made, all of the stock between vanes is removed and the workpiece automatically indexes to the next position. The work holding head carries the indexing arrangement which is actuated by the slide bar shown in Fig. 8. When the "inching" operation between two successive vanes is completed, this slide bar contacts the hinged spring loaded finger as shown. This finger pushes the slide bar in and actuates a pawl and plunger arrangement within the head, causing the workpiece to index

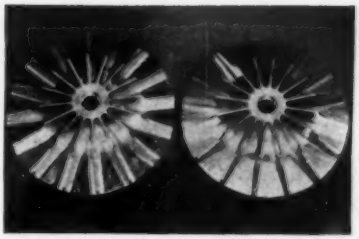

Fig. 7—Before and after third operation, milling stock between vanes.

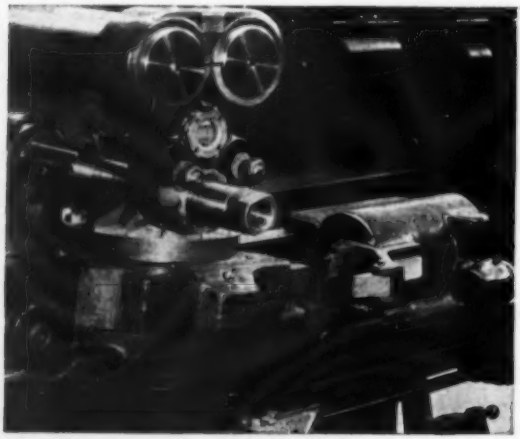

Fig. 8—Closeup of fixture for removing stock between vanes, showing indexing fingers.

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1/16 of a revolution. On the next cutting stroke the work holding head "inches" 1/15 of the distance between successive vanes in the opposite direction and thus misses the hinged stops on the return stroke. The workpiece always indexes in the same direction, but direction of "inching" reverses for each vane.

These three fixtures practically eliminate hand finishing on the impellers and increase production greatly. They are designed to give a minimum production of three pieces per hour. However, the actual production is six per hour and a high uniformity of product is obtained.

Fixtures of this type add greatly to the versatility and flexibility of any production line. Since they are "self contained," that is, have the necessary movements automatically obtained from a single unit, they can be rapidly and easily removed from the machine leaving it free to work on "bottlenecks." This is especially important at the present time when there is a great shortage of machine tools.

Fig. 9—Closeup of fixture showing inching cam.

Fig. 10—General view of machine and twin rotary table fixture for milling radii on army tank track driving links.

Another typical example of a "self contained" fixture is shown in Fig. 10. Here is a standard 2K vertical milling machine equipped for milling radii on track-driving links for the medium army tank. The special equipment consists only of a twin rotary table, suitable hand clamping fixtures, and a special cutter. The power driving mechanism is standard.

This driving link contacts the sprockets which are milled as described in a previous article in the June issue. They are subjected to every sort of stress possible and also to the abrasive action of sand and dirt. They must, therefore, be made of very tough, hard steel forgings and this makes machining difficult. The set-up must be extremely rigid and must have accurate, positive control.

This milling problem is a typical example of the decisions which a production engineer must make. This radius milling operation could be done on a standard rotary table, but due to

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ALTER EGO: Forget welders. THINK ABOUT WHAT YOU WANT A WELDER TO DO FOR YOU.

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the cutting time required, the operator would be idle for a considerable part of the time. Also after finishing one cut the machine would stand idle during reloading. By the addition of special twin tables the operator can load one fixture while the other is under cut. A clutch provided between tables makes it possible to operate one table independently of the other. The interval of time between cuts is less, the operator's time is utilized, and production is increased. The initial cost of the special twin tables is more than one standard table but the increased production offsets this entirely in a very short period of time. In addition, they can be used for many other radius milling operations which must be done on a production basis.

The drive for the tables is taken from the auxiliary shaft of the machine through the drive bracket into the tables. The worms which drive the tables are hollow and the drive shaft passes through them into the clutch mechanism. Hand rotation of the tables is obtained through bevel gears to the worm and wormwheel drive. Antifriction bearings and grease lubrication are used throughout the design.

The tables are equipped with adjustable precision stops so that a rotation of exactly 180° can be repeatedly duplicated. These stops automatically throw out the clutch mechanism. Exact location is obtained by hand feeding against a positive stop.

Only one radius is milled on each fixture. The workpiece is mounted, first on the right hand fixture and milled, then removed and mounted on the left hand fixture. This eliminates any necessity of cross movement of fixture on rotary table as would be required if both radii were milled in one fixture. The manufacturing cost of such a sliding fixture would not be in proportion to the production obtained.

Longitudinal movement of the machine table for setting the cutter to proper depth on each link is accurately determined by positive stops on the table. One can be seen in Fig. 11.

Location of the workpiece is obtained from two accurately drilled and reamed holes as shown. The locating studs in the simple, hand clamping fixtures are ground elliptically. This

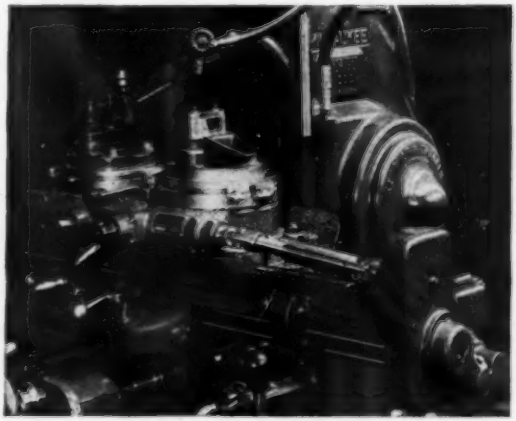

Fig. 11 — Closeup of twin rotary tables driving mechanism and hand clamping fixtures.

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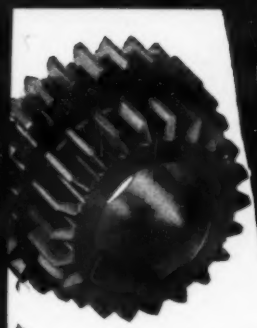
leaves the true diameter in a direction perpendicular only to the common center line of the studs. By doing this, any slight variation in the dimension between the reamed holes does not interfere with loading.

The cutter is of high speed steel, 1½" diameter by 2½" long, left hand spiral, taper shank end mill with 8 teeth. Conventional cutting is used for milling in both positions by rotating the tables in opposite directions. The cutter speed is 153 r.pm. This gives a chip load per tooth of .003" using a 3½" feed.

This article has shown how various milling operations can be performed with specialized equipment used in conjunction with standard machines. It is only after a thorough study of the particular milling problems involved that any special pieces of equipment are resorted to. If the production required, nature of cut, and characteristics of the workpiece, make it possible to use standard equipment, this is always done. In many instances a completely standard vise or slight variation, such as a standard vise body with special jaws, is used as a work holder and thus a special fixture is avoided. A variety of standard attachments such as vertical and universal milling attachments, rack and thread milling attachments, and dividing heads likewise are used to supplement the flexibility of the machine to make it more adaptable to a single purpose job.

Each milling problem is given a detailed analysis and advantage is taken of every standard item which can be used. The cost of designing and manufacturing a single attachment or fixture is naturally high. Therefore, each production milling problem is scrutinized carefully with the definite aim of keeping the cost to the user as low as possible.



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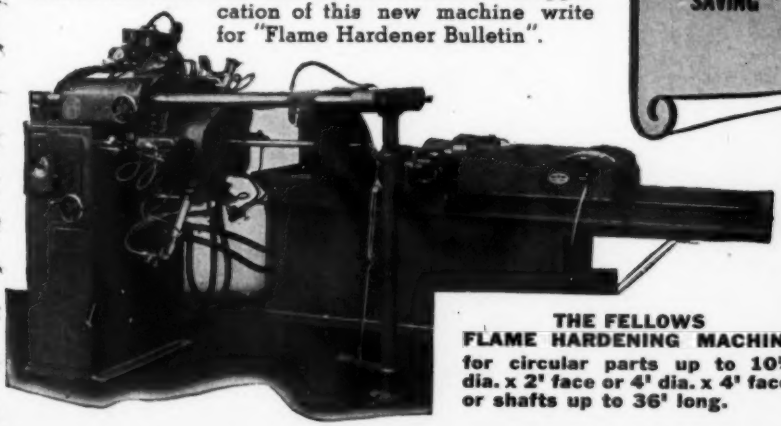

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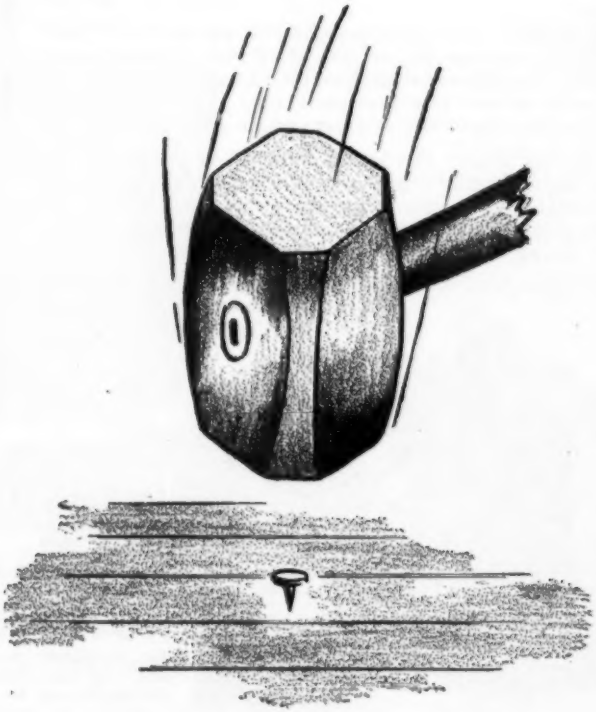

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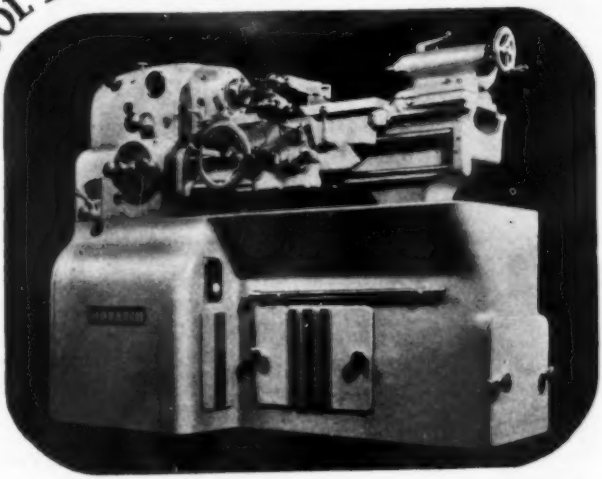

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Automatic Step-Drilling of Deep Holes

By ERIC HIRVONEN

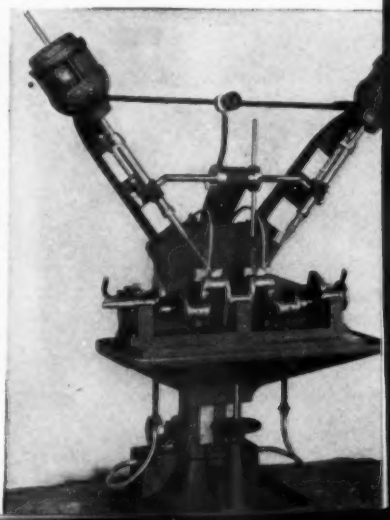
THE automatic step-drilling method is especially adapted for drilling holes in parts that cannot be rotated around the axis of the hole, such as oil holes in crankshafts where the drill has to be removed from the hole to free it from chips. The drill is suitably rotated and reciprocated by the mechanism of the machine. The cycle of drilling a hole consists of fast approach toward the work, a cut into the work at the proper feed rate, a rapid return out of the hole to clear the drill and hole of chips, and a rapid advance of the drill to the bottom of the hole for another cut. This series of progressively longer advances and retractions continues until the hole is the desired depth when the drill is retracted to the starting position and the controls are automatically reset for the next cycle.

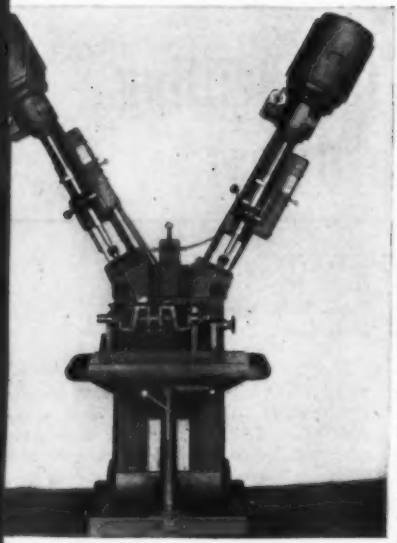
Formerly, all drilling of this type was performed on a manually operated machine such as the one shown in Fig. 1. The hard manual labor connected with the operation of a machine of this type led to the development of the automatic step-drilling machine. Fig. 2 shows a machine with two angular spindles and simultaneous starting valve for the hydraulic step-drill mechanism. One operator can handle several of these automatic machines as they run without any attention except changing the work and initiation of the cycle.

Fig. 1 — Manually operated machine for step drilling oil holes in an automobile crankshaft.

Feed Rate and Type of Drill Used

The unit shown in Fig. 3 is adapted to be mounted on the frame of standard drilling machine. The drill spindle is adjustably connected to a slide operated by a hydraulic cylinder and piston. The cutting feed rate is adjustable from 0 to 20" per min. The fast-traverse movements are at a rate of 1 fps or 720" per min. The length of the steps can be varied from a minimum of ⅛" to any desired distance. Gaps, or openings in work through which the hole to be step-drilled





passes, can be fast-traversed to eliminate loss of time. The maximum depth of hole can be adjusted to any distance within the capacity of the unit. A diagram of the hydraulic step-drilling mechanism is shown in Fig. 4.

The drill used for step drilling is a two-grooved twist drill. A regular stock drill will be entirely satisfactory if the hole is not deeper than can be reached with the drill. For deeper holes, drills longer than stock length, but fluted only part of the length to maintain maximum stiffness, are used. The flutes should be polished to facilitate free cutting. The unfluted portion of the shank should be slightly smaller in diameter than the cutting part to prevent trapping of coolant in the hole at entrance of the drill into the hole. Thick-web drills, such as had to be used on manually operated deep-hole drilling machines to prevent breakage of drills, are not required for most of the automatic step drilling. The grinding of the drill point should preferably be done on a twist-drill grinder, to

Fig. 2 (above) Automat- machine for step drill- g oil holes in an auto- bile crankshaft.

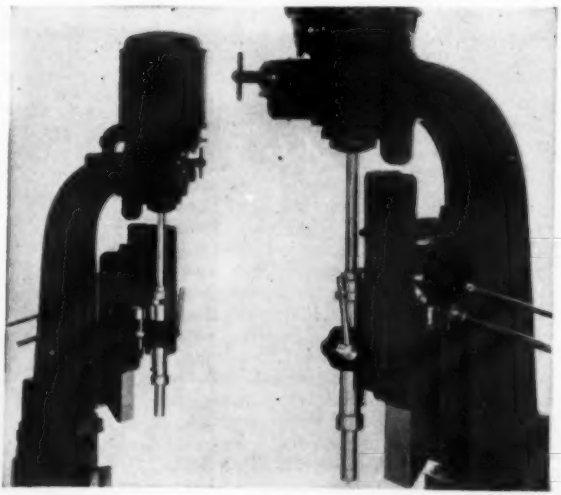


Fig. 3—Step-drilling unit ounted on the frame of standard drilling ma- ine.

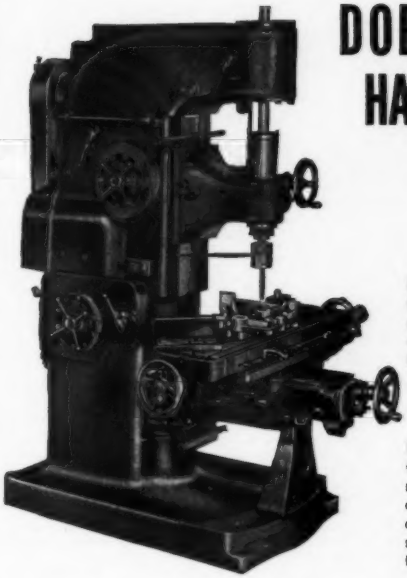


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FIG. 4—DIAGRAM OF HYDRAULIC STEP-DRILLING MECHANISM.

(Valve A controls all movements of the drill. It is operated through bell crank B by cams C and D on a bar connected to the main drill slide. Spring plunger E tends to throw the valve A to either of the extreme positions which are the fast approach and fast reverse. Cam D brings the valve to the adjustable feed position and wedge F throws the bell crank over the point of the spring plunger to fast reverse. Length of drilling step is controlled by the spacing of pins G which make contact with the rocking wedge F. Cam D moves on the bar with the feed; thus lengthening the fast approach and return strokes. Rocking movement of wedge F permits it to pass under the pin G that reversed the unit at the preceding step; but pin T on the bell crank moves it again to the interference position with the next pin. Plunger L through lever K and valve M starts the unit after withdrawal. Adjustable stop P controls the final depth of the hole by depressing latch R to cause resetting of cam D at the final retraction. Cam C holds the unit at the retracted position. Manually operated remote-control valve N is used to start the cycle through plunger H. Plunger I reverses the drill if interruption of the drilling cycle is required; latch J pushes plunger L to bring the unit to stop at the fully retracted position. Valve O is an automatic throttle to keep constant back pressure on the piston and vary the pressure on the forward side according to the demand of drill thrust. Gage U shows the pressure required to feed the drill.)

insure equal cutting lips with correct angles and clearance. Long straight chips should be avoided by changing the grinding of the point. A curly chip is much easier to dispose of than a straight one. The web at the drill point should be ground thin to reduce thrust on long drills.

Cooling the Drill

Proper and ample supply of cooling fluid is an important contribution to economical deep-hole drilling. The non-rotating work makes possible a simple and effective application of coolant. The flow must be across the hole around the drill to wash away all chips and cool the drill during its retraction. To prevent chips from being washed back into the hole, the flow must not be fast or directed into the hole. A gentle flow of coolant, in sufficient quantity, will fill the drilled hole, thus absorbing heat from the workpiece. Outside surfaces of the work should be cooled by a fluid flow, either by the overflow from the drill cooling stream, or by separate openings, distributed around the piece. This is especially important for pieces with light sections around the hole. Water and soluble-oil mixtures are suitable for steel drilling. Cast iron and other materials that have powdery chips which will form paste with cooling liquid can be cooled by an air stream. Flow of the air stream

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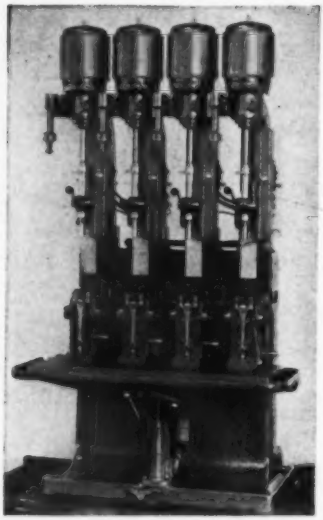

Fig. 5 — Typical four-spindle automatic machine for step drilling the hole in an automobile-engine connecting rod.

should be applied the same as the liquid, around the drill at retraction, and on the outer surfaces of the work. There is no trouble in getting chips out of the hole, even when the drill spindle is vertical, or nearly so. All step-by-step drilling with a liquid coolant should be done at some angle above the horizontal in order to get the coolant into the hole at the retraction of the drill. Drilling without liquid cooling may be done at any angle, but on vertical work the chips must be blown or sucked away into the hole. A steel chip at the drill point on the bottom of the hole will spin with the drill and prevent cutting entirely.

Length of Drilling Step

The distance a drill may be fed into the work, which is the length of drilling step, depends mainly on the material being cut but also on the coolant for the drill and work. Shorter steps permit better cooling and consequent higher rate of feed and penetration, although, even without outside cooling medium, short steps mean much cooler drilling, because the shorter the step, the less heat is absorbed by the drill and work. For example, if the step is doubled in length, the time is also doubled, the quantity of chips from the original length of step will be in the hole twice as long as in the shorter step, and the time and quantity of chips of each step approximately equal to the the shorter step.

Experience has shown that best results are obtained by having the depth of each step approximately equal to the diameter of the drill up to ¼" when drilling steel with ample supply of coolant. Maximum penetration with drills larger than ¼" can be obtained by increasing the depth of steps by, perhaps, one quarter of the drill diameter above and over the initial ¼" depth. Thus, a ½" drill may have steps of ¼ + (¼ x ½) = ⅜", and a 1" drill ¼ + (¼ x 1) = ½". This rule holds regardless of the degree of hardness of the steel as the cutting speed and feed per revolution are set to obtain the most economical time between sharpenings of the drill. Therefore, approximately the same amount of heat will be generated in a given distance whether the steel is hard or soft. The time is shorter for the soft material. Longer steps can be used with slower feed rate than the maximum permissible for the material to be drilled. Hence, longer steps than those already mentioned are permissible for deeper holes where the feed is limited by the slenderness of the drill. Iron, aluminum, and other castings that do not form long chips may be drilled in considerably longer steps than the aforementioned materials.

Materials that are hardened by cold work, such as some of the stainless steels, can be drilled with a rigid drill-

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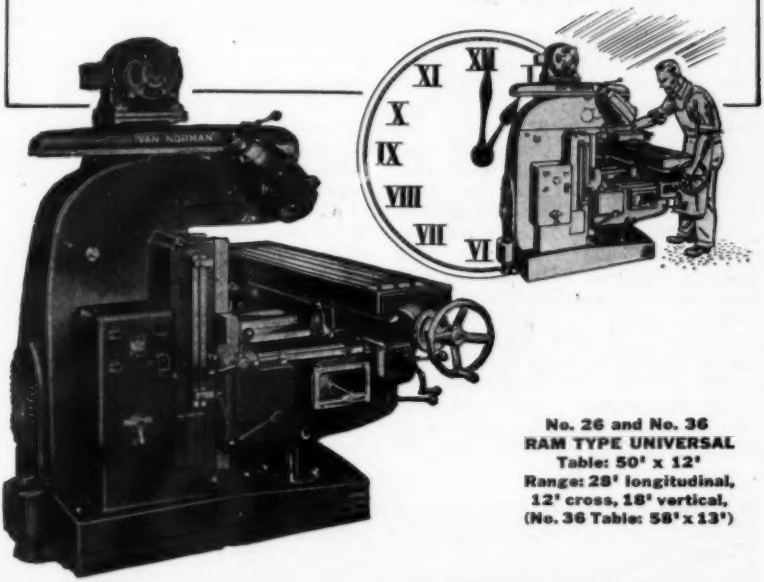

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ing machine where the deflection between the drill point and work has been brought to minimum. This is to insure a quick bite into the work and equally quick letoff, to prevent any "ironing" and consequent work hardening.

Attempts to control the length of the step by increase in torque or thrust have not been successful. There is practically no regular increase in either thrust or torque until the drill has been dulled to cause such an increase. Continuation of the drilling would then be impossible without resharpening, as the drill would be retracted as soon as it started cutting. The increase in torque from chips clogging the drill flutes is indefinite and variable. The steps resulting from torque control will be quite irregular in length. Both feed and speed of the drill will have to be greatly reduced to keep the drill cool enough to have a reasonable life between sharpenings. Therefore, maximum production can be obtained by keeping the steps relatively short and regular in length. Another reason for the regular step is that the straightness of the hole is adversely affected if chips bind in the flutes of the drill.

Rate of Feed and Cutting Speed

The most productive rate of feed can be determined by trial in each case, as it varies with material, length of step, diameter, and length of drill and coolant. Sound produced by the cut is the best indication of the most economical feed. When feed is increased the torsional vibration increases and, beyond a certain point, rapid dulling of the drill takes place. A small amount of torsional vibration seems to help the cutting and more pieces per sharpening can be obtained that way. The length of step and feed rate are also interrelated. The longer the step, the slower the feed. Balance between feed rate, length of step, and drill speed depends on many variables, such as material of the work, type, diameter, and length of drill, and amount and quality of the coolant.

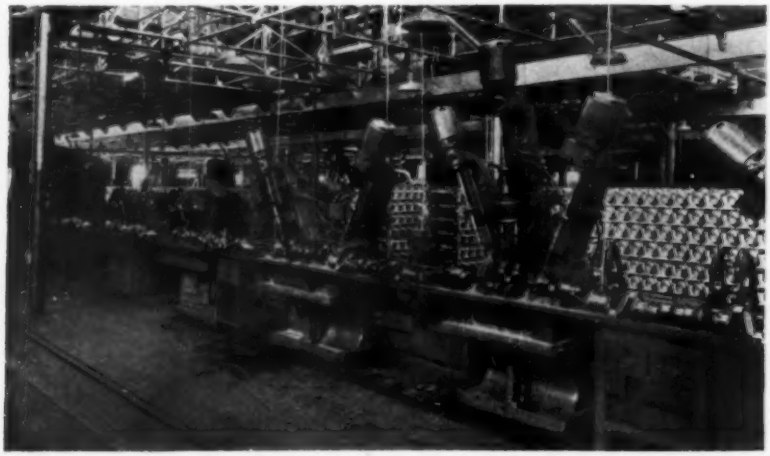

Fig. 6—Crankshaft line in an automobile factory.

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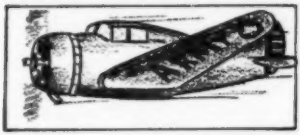

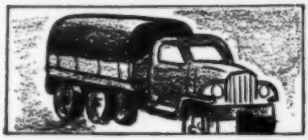

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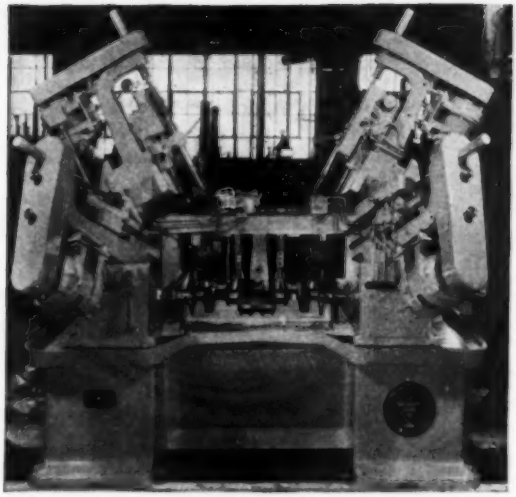

Fig. 7 — Six-spindle machine for drilling at one setting all oil holes in the crankshaft of a six-spindle engine.

Cutting speed may be determined the usual way for the material to be drilled and generally should be as high as possible without causing too much wear at the corners of the drill. Lack of stiffness of drill and shank limits the depth of hole that can be economically drilled to no more than 50 times the diameter of drill for holes over 5/32" diameter. On smaller sizes, the maximum depth is less than 50 times the diameter and depends greatly on material being drilled. There is difficulty with the chips when small holes are drilled in some tough and stringy materials. Frequently, heat-treatment of the work to be drilled to a slightly higher Brinell makes the drilling much easier and free from drill breakage and trouble.

Cutting time lost during the drill retractions further limits the maximum depth on larger sizes of holes to a maximum of 2 ft, or thereabouts, except when drills with oil holes are used, which permit longer steps and consequent increase in the ratio of cutting time to idle time.

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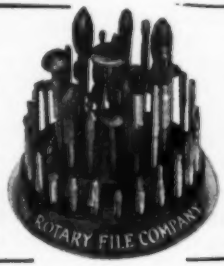

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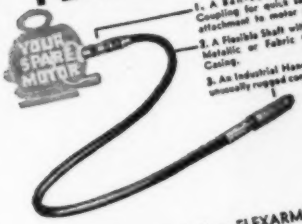

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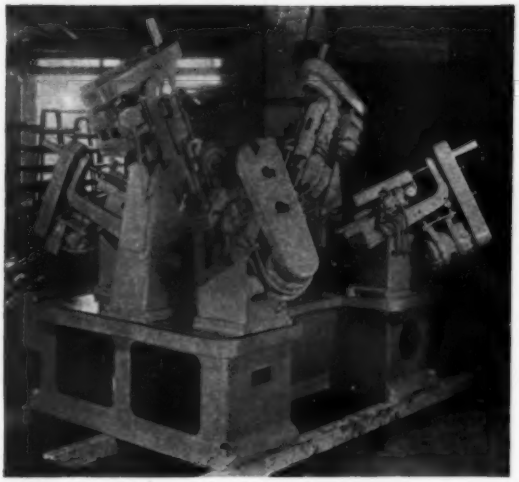
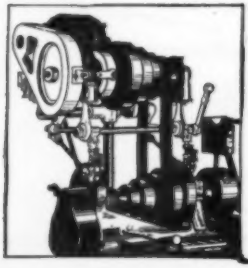


Fig. 8—Corner view of six-spindle machine shown also in Fig. 7.

The usual rate of rapid traverse of the step-by-step drilling mechanism is 1 fps, or 720" per min. For example, drilling a hole 6¼" deep in ¼" steps at a cutting rate of 4 sec per step, a total of 100 sec is used for drilling and about 12½ sec for the fast approach and return strokes. This is a ratio of 8 to 1 cutting to idle time.

Typical Step-Drilling Machines

Drilling a hole 25" deep at the aforementioned ratio consumes 400 sec cutting and 200 sec idle time, a ratio of 2 to 1, that is 50 per cent of the time is used for fast traverses in drilling a hole 25" deep, against only 12½ per cent in drilling a hole 6¼" deep at the same cutting rate. Of course, this is a purely imaginary case to illustrate the relation between cutting time and idle time. Ordinarily, a hole 25" deep would have to be ½" diameter to be economically drilled by the step method. A hole ½" diameter may be drilled with steps ½" long, especially when the drill is long and the feed rate is necessarily low. The ratio then becomes 400 sec cutting to 100 sec traverse time, or 4 to 1. Holes more than



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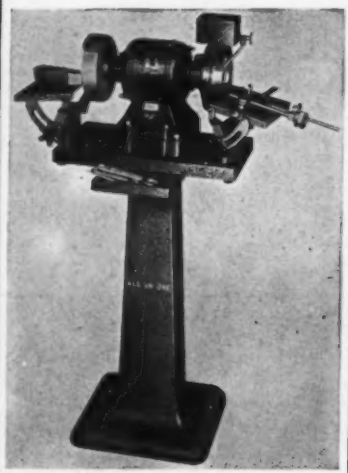

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SINCE 1910

30" deep are being successfully drilled with an oil-hole drill.

Fig. 5 shows a typical four-spindle machine for drilling the oil hole in an automobile connecting rod. The quick-acting jig shown permits one operator to handle 150 or more pieces per hour. This number of pieces usually requires from 6 to 10 spindles, depending on the length of the hole and drilling qualities of the material of the rod. This type of machine and such jigs are also used for larger connecting rods of the type employed in Diesel engines and refrigerating machines, as well as cam shafts and similar parts.

Fig. 6 shows a crankshaft line in an automobile factory. The machines are of the two-spindle angular type such as shown in Fig. 1. The shaft is drilled, a pair of holes at a time, by progressively passing it from one machine to another along the line.

A six-spindle machine for drilling all oil holes at one setting in a crankshaft of a six-cylinder engine is shown in Figs. 7 and 8. The hydraulic clamps for the shaft are worked by one of the two manually operated valves on top of the jig. The other valve is for the simultaneous starting of all the drilling units for the drilling cycle. All drills are inclined at angles above the horizontal to facilitate cooling of the holes.

While the examples of step drilling shown here are for oil or lubrication holes, there are many applications where holes for other purposes are being step-drilled. These include holes in air tools, fuel-injection devices, carburetors, instruments, textile machines, and machine-tool parts and spindles.

Machine designers should investigate the economy of drilling by the step method. Often, designs can be simplified and appearance improved by providing drilled internal passages.

(Illustrations — Courtesy Leland-Gifford Co., Worcester, Mass.)

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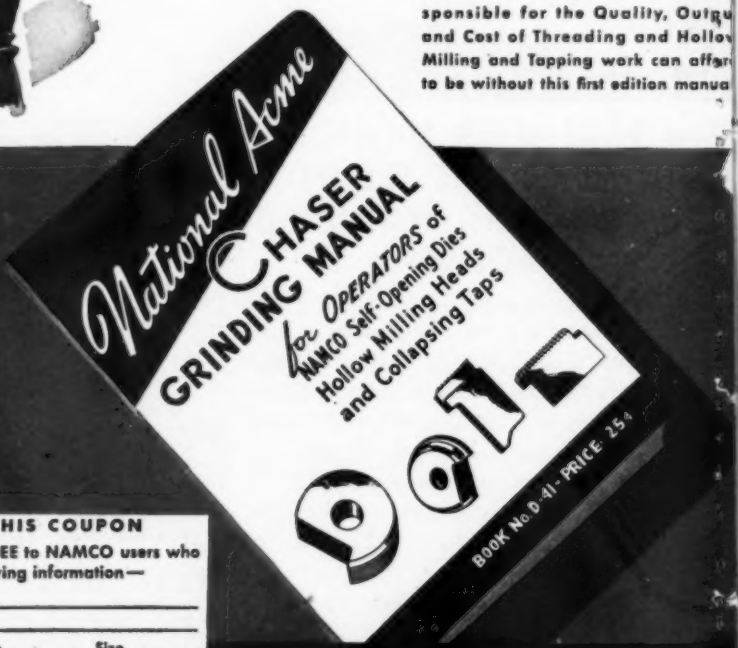

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Surface Grinder Requisites

By H. J. CHAMBERLAND

A SURFACE grinder of the type described herein is unquestionably a useful precision machine tool. Whether this important piece of machine shop equipment is intended for high precision gage or instrument work, or dressed up for the finishing of small parts in multiples, these instances present an example of minimum labor cost without sacrifice of accuracy and finish, even to a slight degree. The better we can fulfill such assignments with the least possible training on the part of the operators, the more we can expedite National Defense production.

In considering what dependability really means in connection with all precision operations involved, we must primarily bring out the ordinary causes of vibration. This arch enemy is responsible for more than 50% of surface grinding failures. It is generally assumed that when a surface grinder is installed on a cement floor or substantial foundation, that is the end of vibration. Such a guess is indeed false because if the machine has a tendency to vibrate, it will do so even if operated in a stone quarry.

Vibration in a surface grinder, or any other so-called precision machine tool for that matter, may develop, not only from multiple causes, but from a single component out of balance because of poor design, careless machining, or assembling errors. Therefore, to be vibration-free in its entirety, it is imperative that equipment of this nature incorporate maximum rigidity from head to foot.

1 — With correctly distributed weight, plus advanced design and accurately coordinated parts, the operator can do more and better work.

2—When surface grinding one, or a dozen parts simultaneously, retouching due to variation in dimensions is eliminated when there is no vibration.

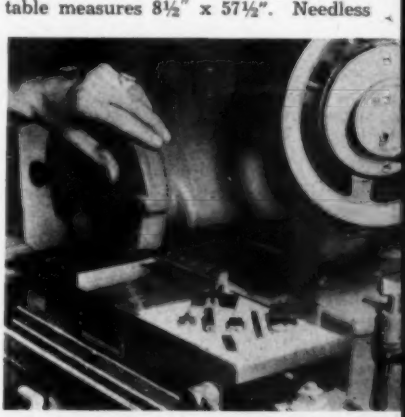
To meet present-day standards of quality and quantity, especially National Defense requirements, this type of surface grinder must have scientifically balanced strength and rigidity. Such a precision machine tool must also be engineered for ease of operation, with positive control over a wide range of feeds. Last but not least, all components must be expertly machined and assembled to guarantee precision within, if precision is to be expected without.

Experience with these machines through the years has convinced me that, generally speaking, the importance of design of base, column and spindle housing unit has by far been underestimated. In the past, even the grinding spindle itself, the heart of a grinder, required frequent attention and seldom had power to spare.

Any tool room or production surface grinder, can best serve its purpose when designed so weight will go substantially beyond its work capacity. If in this connection, all components are relatively well balanced, precisely machined and expertly fitted to or into each other, such an assembled unit is not likely to develop vibration.

It is obvious that with all precision grinding operations, accuracy and surface finish must usually do teamwork. It is no problem to get either when time does not matter, but today we must have both with speed and it cannot be done without properly engineered equipment.

With the surface grinder in question, the vibrometer dial remains quite dead for several reasons. In the first place, base of the machine exceeds 800 lbs., and this is an exceptionally good start to lick vibration. The column, being of box construction and supported by a bearing 30" in length, is next in providing security against vibration. Saddle and table, of course have relative rigidity. The saddle is mounted on a base 21" long and the table measures 8½" x 57½". Needless



3—A surface grinder of this type is an asset only when it can expedite parts in quantities to the same degree of accuracy as a single forming tool.

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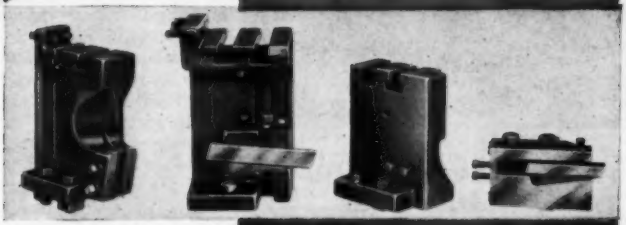

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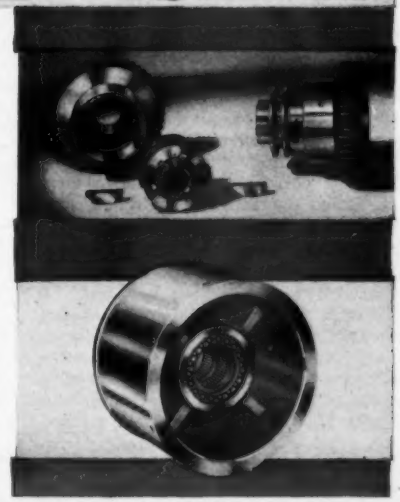

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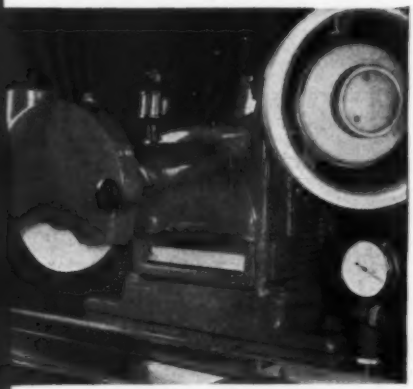


4—With such developments as the dial indicator to command .0001" vertical adjustments, plus adequate illumination from light built in column, precision surface grinding is simplified.

to mention, material for all components is selected for strength and wearing qualities.

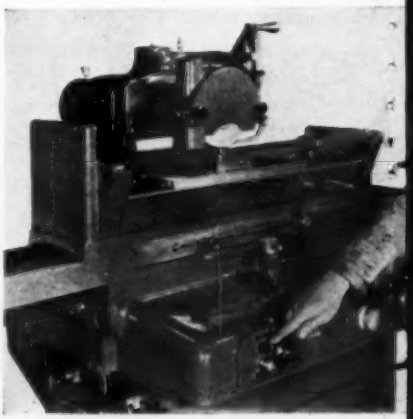
It has seemed to me that some of the older designs of surface grinder always were more unreliable than some other precision machine tools. For example, inefficiency in wheel head-spindle unit, frequent misalignment of vertical and traverse movement and a jelly-fish-acting column with every kick-off of traverse feed when automatically operated, brought on daily production headaches.

It makes sense that the production set-up, engineered in the making of a precision machine tool, has much to do with the introduction of numerous modernized features at practically no extra cost. In this particular instance, six models can be completed from the same production lot of machines. Such improvements in production methods are most effective in controlling costs and assure quicker delivery at minimum price.

This improved production method is but an arrangement whereby a single basic model is modified in six ways. Therefore, the chief objective of producing a vibration-free machine, regardless of its intended purpose, is not in the least effected. All models differ only in the way the table and cross feed operate. Plain models have manual table and cross feeds, or manual table and manual-power cross feeds, but retain the sight oil cup method of lubrication. Other advanced models range in modernization from hydraulic table feed and power cross feed to hydraulic and manual table feed and power-manual cross feed, but incorporate a specially developed forced-feed lubrication system for the ways.

Of particular significance is the elimination of power table movement in all models, and for a very good reason indeed. The so-called "hydraulic shock" at the end of each longitudinal stroke, when the table is power-operated, may cause a top-heavy column to sway with results well known to many surface grinder operators.

We have now reached the point where



5—With modern responsive controls, adjusting table and cross feed become a light task.

What do You NEED *in* AIR CONTROLS?

DEPENDABILITY?

Ross Valves are today giving day-in-and-day-out performance—without delays or shut-downs—in hundreds of diversified plants.

EASY INSTALLATION?

Ross Valves, with all ports on one face, can be mounted anywhere, in minimum time. And if occasion requires, can be and are changed in three minutes' time.

SPEED?

Ross Valves control a welding operation which produces 400 welds a minute—more than 6½ per second.

LONG LIFE?

Ross Valves, made fifteen years ago for heavy duty Steel Mill work, are still in active and satisfactory operation.

EXTRA STRENGTH?

Ross heavy-duty valves, produced after many years of air control experience, provide an extra-wide margin of strength for the unusually tough job.

SOME SPECIAL PROBLEM?

The Ross Engineering Staff—and Ross mechanics—have for long years specialized on the design and production of Air Control Valves *only*—and they are experts at that job. . . . If you have some specially difficult or specially intricate problem of air control, Ross technicians will solve it for you.

Bring your air control problems to Ross.

ROSS Operating VALVE CO

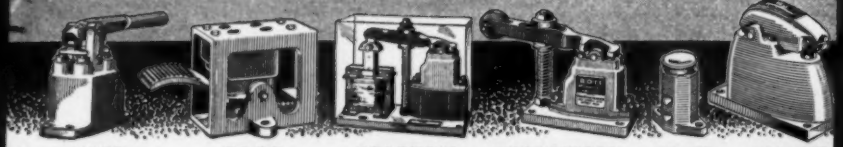
6480 Epworth Boulevard

DETROIT, MICHIGAN

ROSS Air Control VALVES

THE BRIDLE [illegible] FOR AIR HORSEPOWER

A SIZE AND TYPE FOR EVERY OPERATION



HAND CONTROL | FOOT CONTROL | SOLENOID CONTROL | MECHANICAL CONTROL | PILOT CONTROL | ALL AIR CONTROL

6—Vertical, table and saddle ways are expertly hand scraped for proper sliding fits. This overcomes amplification of play which would cause vibration.

a tool room or production surface grinder could be built like a Swiss jig borer and still be of little value, if the spindle failed to deliver. Since the spindle governs the efficiency of any grinding machine, it is nonsense to risk anything but the best spindle construction available.

For satisfactory operation, it is imperative that both constituents, motor and spindle, be dynamically and statically balanced for imperfection in one will offset the closest precision in the other. There is also the selecting of balls and other technicalities which vary more or less in all makes. For example, the balls used for this particular grinder's spindle are so perfectly matched that all going into one bearing must come from the same production lot and left - over balls are scrapped. As a matter of fact, it is a six-month process to make these balls, due to importance attached to this precision controlling member.

Ease of operation along lines of finger-tip control, for fine cross feed adjustments and infinitely variable table speed, are developments which make for close precision with less experience and a saving in time. Another fine asset is a vertical feed dial indicator adjustment to hit that .0001 or .0002" right on the nose. This is a positive and direct measurement between spindle and table rather than an indirect measurement based on the accuracy of the vertical screw and its gear train.

No less convenient and desirable is in-built illumination in the column instead of the head, thus providing light under the wheel where the operator needs it the most. Better illumination means better work with less eye strain whether one is filing or doing precision grinding.

Care of Grinder and Magnetic Chuck

Any grinder of this type is a precision machine tool and cleanliness means plenty. Whether used for wet or dry grinding, the equipment requires extreme care to avoid premature wear, regardless of construction measures incorporated to exclude grit.

When a coolant is used, the best is not too good. A properly prepared compound serves to prevent rust and

7—A modern grinder must be ready to "do its stuff" on delivery and must sustain its accuracy. That's why it is checked, actually operated, and double-checked before shipment.

Torque Wrench

MORE ACCURACY
LIFE
SPEED
3 DIALS

NO FRICTION
ADJUSTMENTS
MOVING PARTS
FRAGILE MECHANISMS

Constructed for exacting laboratory work or continuous production use.

A practical wrench correctly engineered.

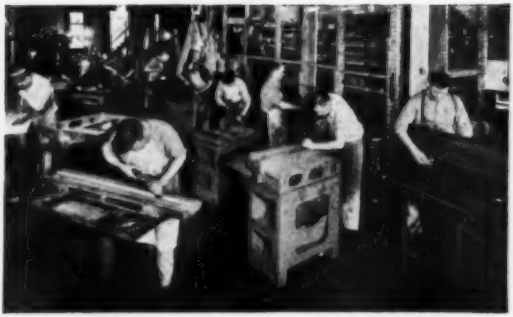
PERMANENT ACCURACY.

A capacity and size to fit your needs.

State capacity needed.

PIONEER MANUFACTURERS OF ACCURATE MEASURING WRENCHES

P. A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS



8 — Another glimpse of Grinder production showing the careful hand scraping of table castings.

imparts a superior finish to the work being surface ground.

In plants where a battery of grinders are in operation and under supervision of a foreman or linesman, the upkeep system is usually very good. On the other hand, and especially on tool work, when but a single surface grinder is available, Jack depends on Harry to do the nursing and vise versa. It is best to compel every operator to brush off and thoroughly clean the machine on completing his job, to prevent dirt pushing in more dirt. The oil cup lubricating system usually gets the worst licking in this connection.

As for the magnetic chuck, the less it is removed from the table the better it is all-around. It is not, of course, necessary to resurface it each time it is disturbed. Since the grinder herewith concerned has a 12" vertical adjustment, this range is decidedly favorable.

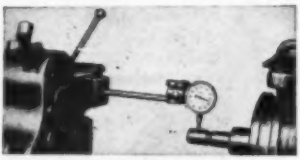
When and if the magnetic chuck has to be resurfaced, it should be done with extreme care. Grinding wheel manufacturers furnish a wheel expressly made for this operation and it is advisable to give this particular one the preference. This job demands an extremely light vertical feed, cross feed and medium table speed. If no hydraulic table feed is available, I advise manual operation with types of surface grinders equipped with automtaic table travel.

Parallelism Is Key to Grinding Accuracy

With a substantial volume of surface grinding operations, parallelism is a chief requisite. Whether the grinding is done with both sides of the wheel or the operation involves a squaring

MAGNETIC

Indicator Base



The Mellaphone Magnetic Indicator Base is a powerful magnet. It holds tightly to any iron or steel surface providing quick indicator settings. Can be used in any position. Small base area for restricted places. Can be quickly moved or placed on any machine. Guaranteed full strength for 5 years.

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MELLAPHONE CORP.
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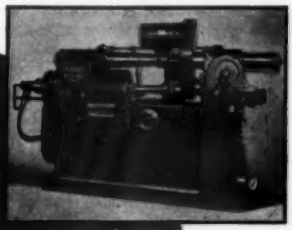
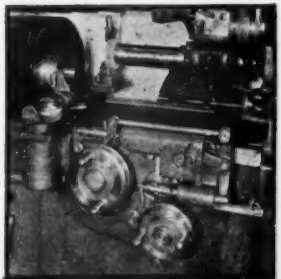


Bryant 16-C-16 Internal Grinder

MONEY IN THE BANK

WHEN PARTS ARE GROUND ON BRYANT GRINDERS

You'll be money ahead if Bryant Hydraulic Internal Grinders are used for grinding all the holes and faces on your parts. These time-saving, cost-saving grinders are "just what the doctor ordered" for both commercial and defense needs. Pictured here is a Bryant 16-C-16 used for grinding the bore of aircraft engine cylinders. The line drawing shows how the control bar guides the wheel in the cylinder so that straight and curved portions may be ground in one handling—with absolute accuracy—fine finish—and at low cost per piece.



Whether you're watching every minute on defense work or watching every penny on peacetime products, it will pay to investigate the Bryant line of Internal Grinders. Put in a Bryant and put money in the bank.

BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VERMONT, U.S.A.

job requiring the wheel face and one side, the least amount of vibration due to wear is sure to affect the accuracy of cuts because the wheel must necessarily clear all surfaces with each pass.

Any error in parallelism due to sweep of the wheel generating an arc may be traced to the table not traveling in a line exactly square with the spindle axis. This misalignment may result from worn spindle bearings or wear in one or more locations of the vertical mechanism.

Importance of Grinding Wheel Selection

It does not pay to skimp with grinding wheels in surface grinding practice. Unfortunately, many small plants still try to get by with a limited supply, but with more or less disadvantage to the maximum efficiency of the machine.

Grinding wheels must be selected with the same care as the materials they are to grind, since they must possess certain characteristics giving them individual cutting qualities. A dependable surface grinder needs and is entitled to a complete assortment of grinding wheels in various grades, grains, bonds and structure, so the productiveness and precision possibilities of the grinding machine will not be impaired in any way.

The nature of the material to be surface ground, amount of stock removed and finish desired unite to determine which wheel to use. There is no excuse for gambling in this respect because grinding wheel formulae have certainly kept in line with materials and machine tool developments.

Less we forget, many a costly die has been sent to the scrap pile through ignorance of wheel selection and at its most expensive manufacturing stage. Frequently, such mishaps represent the cost of a dozen or more wheels. Regardless, it pays to "have the goods," whether making of the part to be ground costs a dollar or a hundred times that.

It is of particular importance to note that so little change has occured as to the method of surface dressing of grinder wheels. We speak in terms of hydraulic table feed and .0001" vertical feed control, but still use the little block and like it.

Thermocouple Data Book

Wheelco Instruments Co., Chicago, offer a new Thermocouple Data Book and Catalog which is claimed to be one of the most complete compilations of data for thermocouple users.

Its 32 pages contain such valuable information as temperature conversion tables, millivolt tables, pipe and wire sizes, decimal equivalents, wire resistances, recommendations for checking thermocouples and pyrometers, information on how to construct thermocouples, etc. Prices and descriptions are given on the complete line of thermocouples and thermocouple accessories.

The First Step in Defense Production
Milliken Bench Plates
and Angle Irons
In laying out work and setting up most machines you will find the adaptability and accuracy of Milliken plates and irons indispensable. Priced to appeal to every machine shop operator. Shipments from stock. Write now for specifications and prices.
Milliken Machine Company
23 Prospect Place,
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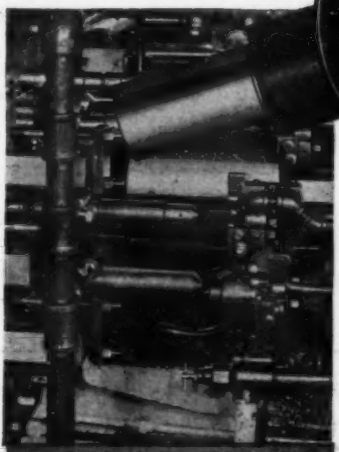
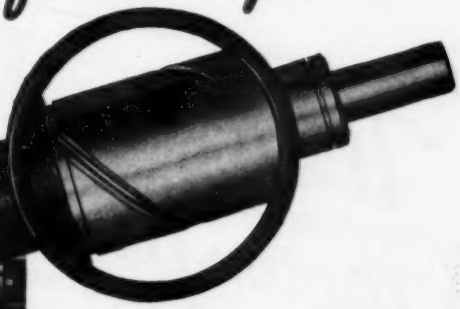
Cone is first again!



This unique job is produced on a 2" / 6-spindle Conomatic equipped with a Cone Groove Roll Attachment. The transmission shaft is 9" 4 inches long and 1 11/32 inches in diameter. The material is SAE 4140 hot rolled. The grooving is one of seventeen machining operations, all completed within a cycle of 44 seconds.

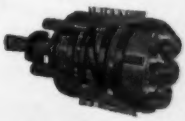


WITH AN ATTACHMENT FOR ROLLING OIL GROOVES DURING THE AUTOMATIC CYCLE

The rolling of the oil groove in the shaft shown above is another CONE FIRST. A device or attachment that increases facility without interfering with a machine's trunk-line efficiency is a device of merit.

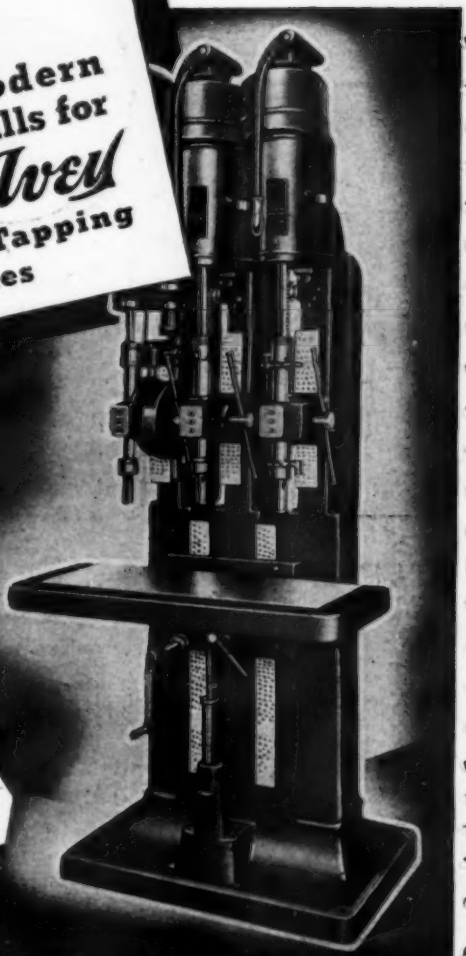
CONE FIRSTS are engineered to give additional breadth of service to Cone Machines without interfering with their efficient trunk-line performance.

It will pay you to keep up with the CONE FIRSTS! Write today for particulars.



CONE AUTOMATIC MACHINE CO., INC.
WINDSOR, VERMONT, U. S. A.

Why Modern Production Calls for Motor-Avey Drilling and Tapping Machines



7 GOOD REASONS . . .

- Precision built for precision work
- Highest quality in materials and workmanship for dependable, continuous, long life service
- Modern in every detail of design, capacity and construction
- Various types . . . 6 or 8 spindle speeds . . . for ordinary or high speeds
- Two speed motor with three mechanical changes
- Push button control . . . low, stop and high
- Fast workers in any material . . . thus speeding up production and assuring maximum returns on the capital investment

Write for Illustrated Literature

1¼" TO .010

THE AVEY DRILLING MACHINE COMPANY
CINCINNATI, OHIO

D. C. Rectifiers in Industry

By ALLEN R. HAMILTON

ALTHOUGH much has been written about electronic controls for industrial purposes, very little has been said about electronic power rectifiers for converting alternating current (a.c.) into direct current (d.c.). Thus, many engineers and plant maintenance men are unaware of the advantages that rectifiers can offer. The purpose of this article is to explain in simple language, the operation of electronic rectifiers, and to describe a few of the many uses to which they may be applied.

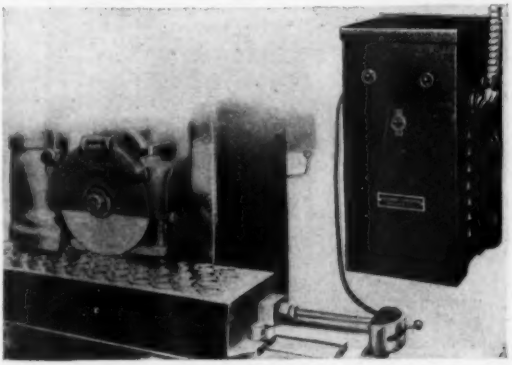
Direct current power lines are rapidly being discontinued in most sections of the country, due to the heavy voltage drop which occurs in transmission. Since d.c. voltage cannot be "stepped up" or "stepped down" by means of transformers, it must be generated and transmitted at the voltage the consumer requires. Yet there are many jobs which can be done well only with d.c. Among the types of work for which a.c. is unsuitable, three of the most notable are:

1. Energizing of electro - magnetic equipment such as magnetic chucks, pulleys, brakes and separators; solenoids and lifting magnets.

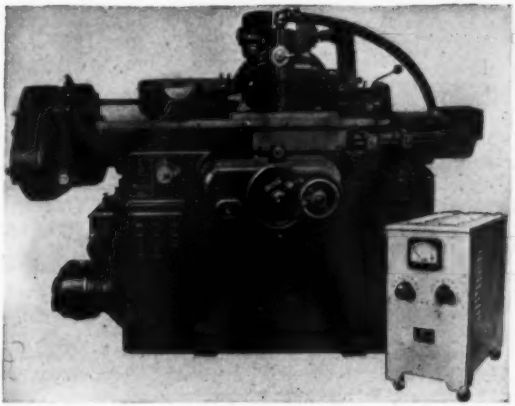
2. Supplying power to d.c. motors where high starting torque or accurately controlled variable speed are required. (Elevator and electric train or crane motors require both high starting torque and wide speed range).

3. Supplying power to carbon arc lamps for laboratory work.

The modern trend is to eliminate d.c. wiring entirely from the building, and install converting equipment at each machine or location where the d.c. is required. Thus, machines may be scattered throughout the building with-



Small single phase rectifier used to supply d.c. to a magnetic chuck on a surface grinder.



Automatic thread grinder driven by d.c. motors, operates from power supplied by a three phase electronic rectifier.

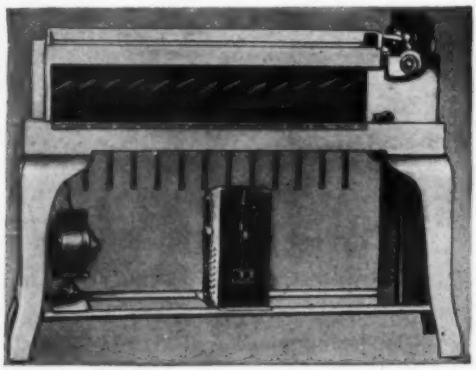
out the necessity and expense of running long d.c. lines. Futhermore, full voltage reaches the machines as d.c. line loss is eliminated.

What Is An Electronic Rectifier?

The electronic rectifier consists mainly of a transformer and one or more rectifier tubes. By means of the transformer the incoming a.c. voltage may be stepped up or down as desired.

The tubes act as check valves which permit the flow of current in one direction only. Thus, the reversing direction of flow of alternating current is "rectified" or changed into current which flows in one direction only.

In special cases, the pulsating voltage output is objectionable. There a filter may be added to the unit to produce any required degree of smoothness in the output voltage. The filter generally consists of an inductance and a capacity. The inductance acts upon pulsating electric currents in a manner similar to the action of a flywheel on mechanical pulsations, while the ca-



I. B. M. sorting machine requiring d.c. for its solenoid magnetics, uses an electronic rectifier as a source of d. c. power.

LARGE Precision Hydraulic Cylinders solve this problem . . . *Easily*

Several recent designs of large broaching machines and other types of machine tools would be impractical without the hydraulic operating cylinders built by Hannifin to meet both the size and the precision standards required. Hannifin cylinders of 11 inch bore, 16 feet long, weighing 3640 lbs., are but one example of large cylinders produced by Hannifin precision methods in regular everyday production.

Big or little, Hannifin cylinder construction and finish is the same for all sizes. Mirror finish honing of the cylinder bore, even in sizes as large as 22 feet long, produces a straight, round, perfectly smooth cylinder interior. High efficiency piston seal, minimum fluid slip, long life, and maximum usable power are the natural results of Hannifin construction features. No-tie-rod design allows removal of end caps without collapse of other parts, and also permits independent positioning of end caps for convenience in installation.

Hannifin hydraulic cylinders are built in seven standard mounting types, with small diameter piston rod, 2 to 1 differential piston rod, or double end piston rod, with or without cushion. All sizes, any length of stroke, for working pressures up to 1000 and 1500 psi. Special types built to order.

Whether you need large or small hydraulic cylinders, investigate the exclusive advantages of Hannifin design and construction. Write for Bulletin 38-H, with complete specifications.

117-inch Cylinder

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MANUFACTURING COMPANY
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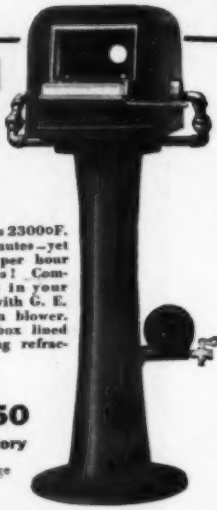

JOHNSON No. 120 Hi-Speed Furnace

This furnace reaches 2300°F. in less than 30 minutes—yet consumes less gas per hour than ordinary units! Compact—it saves space in your shop! Equipped with G. E. motor, and Johnson blower. 13⅛"x7¾"x5" firebox lined with 2½" insulating refractory.

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Over 40th ANNIVERSARY YEAR

JOHNSON GAS APPLIANCES FOR EVERY INDUSTRIAL PURPOSE

The tube is the heart of an electronic rectifier. This particular tube is rated at 15 amperes.

pacitor can be compared to a reservoir. The electrical inertia of the inductance and the ability of the capacitor to absorb pulsations, will produce a smooth output wave shape. The sine wave patterns accompanying the circuit diagrams, show the extent of fluctuation in the output voltage of unfiltered single phase and three phase full wave rectifiers.

Since the rectifier operates with no moving parts, there is nothing to wear out mechanically or require attention. Dirt and oil have no harmful effect.

The tubes are the only parts which require occasional replacement. Modern rectifier tubes are extremely rugged and will give long life even under continuous production running. New filament designs have practically eliminated sagging. Mercury vapor tubes operate with a very low internal power loss and a constant internal arc drop. This means that the efficiency will be high and the d.c. output voltage regulation will be good.

Compactness and ease of installation

With these

FITCHBURG GEAR GRINDERS

NEW OPERATORS CAN SPEED OUTPUT AND BOOST PROFITS FOR YOU

UTILIZING the formed wheel method with automatic closed cycle, new operators can be quickly trained to produce accurate work with fine finish at higher speeds on these machines.

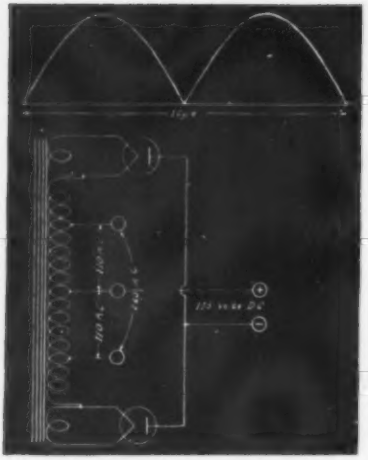
Electric counter control makes overrunning unnecessary on most work, but extreme accuracy is easily obtained by a final truing followed by a light cut taken on a single operating cycle.

Accurate truing is simplified by 6 to 1 ratio of former size to grinding wheel size, which minimizes errors.

New free booklet profusely illustrated gives full information on this profit producing equipment. Write for it today.

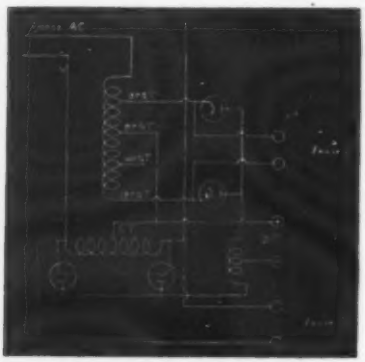
FITCHBURG GRINDING MACHINE CORP.

1809 FALULAH ROAD, FITCHBURG, MASSACHUSETTS, U. S. A.



Single phase full wave rectifier circuit of the type used for supplying current to small motors, electro magnets, etc.

are evident from the photos. Rectifiers may be mounted directly on the machine to which they are connected, or they may be placed in a corner, or mounted on the wall. Wheels can be attached for portability and the smaller models can be carried about by hand.



Scott "T" three phase - two phase rectifier, providing both two phase a.c. and d.c. from three phase a.c. line. Used for testing purposes.

What Rectifiers Will Do

The electrical possibilities of rectifiers are almost unlimited. They can be wound to operate from single phase, 2-phase, or 3-phase a.c. in any desired voltage and frequency. The d.c. voltage and current combinations can be chosen at will. Selector switches can be used to obtain a number of different voltages from the same rectifier, or by using an adjustable voltage transformer, the d.c. voltage can be varied continuously from zero to maximum.

Three phase full wave circuit providing high power output and relatively ripple-free voltage.

The illustrations show a few of the uses for electronic rectifiers in industry. However, to name all of the uses to which industry puts rectifiers would take a great deal of space. Since nearly any requirement can be met by winding the proper transformer and adding the necessary auxiliary equipment, we find rectifiers being used in hundreds

Sunnen Precision Honing Aids Defense Production—

IN TIME . . . No set up or locating time; removes stock rapidly; produces super-smooth finish.

IN DOLLARS . . . Low in initial cost (basic machine price only $195); economical to operate; requires only semi-skilled labor.

IN MAN HOURS . . . Saves skilled labor and training time—any intelligent young man can learn to do precision work in 24 hours.

IN POWER . . . Uses only 1/3 h.p.—relieves internal grinders and other machine tools for other work.

Throughout the metal working industry the Sunnen Precision Honing Machine is being used by scores of plants working on defense contracts. One manufacturer is using 22 machines—several are using 14—half a dozen using 8 or more.

This practical, inexpensive machine solves five important problems . . .

1. Corrects errors of out of roundness and taper produced by previous operations. 2. Produces super-smooth surface finishes. 3. Finishes internal diameters to close tolerances both as to roundness and straightness. 4. Maintains alignment established by previous operations. 5. Provides simple, low cost, production method of duplicating sizes accurately.

Accuracy within .0001" *guaranteed!* Can be set up and ready to go in less than a minute! Range—internal diameters from .185" to 2.400".

Write at once for an 8-page bulletin—or if you prefer a sales engineer will be glad to call and demonstrate in your plant on your job what this machine can do for you!

SUNNEN PRODUCTS COMPANY

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Typical Uses

"Strict alignment maintained between two holes."

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Hardened Steel Gears. Honing used to remove any distortion after hardening and to selectively size the gears to uniform diameters.

SUNNEN Precision Honing Machine

LOOK
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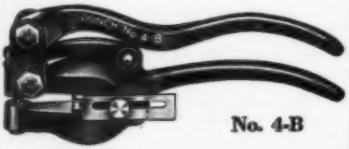
WAW

the sign of QUALITY

CHANNEL

No. 8-B



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Our registered Trade Mark appearing on all our tools, punches and dies is our pledge of DEPENDABLE QUALITY and our guarantee that the tools will give entire satisfaction.

W. A. Whitney Channel Iron Punch shown above makes a ¼" hole in ¼" iron. The No. 8-B punches a ¼" hole in ⅛" iron. No 4-B—¼" hole in ⅛" iron.

Send for our catalog today.

It lists the complete line of W. A. Whitney Punches in every type and size to meet your need.

W. A. WHITNEY MFG. CO.

ROCKFORD ILLINOIS

of unusual jobs.

Summary

Limitations of electronic rectifiers:

1. Where very low d.c. voltage and high current are required, the efficiency will be low and the regulation poor.

2. When dynamic braking is required, a voltage relay and power dissipating resistor are necessary, since the tubes will not absorb power in a reverse direction.

3. Replacement tubes are not stocked by local distributors, and plant electricians usually are not familiar with rectifier circuits. Spare tubes should always be kept readily available.

Advantages:

1. Fool-proof, trouble-free operation, due to the complete lack of moving parts.

2. Simplicity of installation. All a.c. and d.c. connections are made directly to a terminal strip. No starting boxes, rheostats, etc. are required. No special mounting is needed.

3. Low maintenance. Oiling or replacing worn parts eliminated. Dust and dirt cause no trouble. Infrequent tube replacements.

4. High efficiency with excellent voltage regulation.

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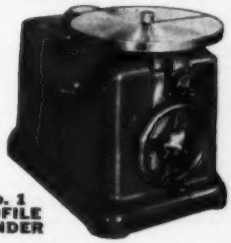

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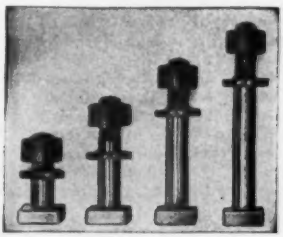

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Spark Identification of Steels

By CARLETON CLEVELAND

SPARK testing is one of the surest and fastest methods of inspecting automotive ferrous metals, assuring that raw materials received from the suppliers meet the specifications prescribed by the metallurgists of engineering and manufacturing departments. Backed by chemical analysis, it effectively guards quality in manufacture and is an important insurance against "mix-ups" of raw stock where one type of steel, being similar in appearance to another and of similar dimensions, might possibly get into the production of a part by mistake, with disappointing and even tragic results.

All the equipment an expert spark tester needs to guard the quality of steels going into the manufacture of vital parts of an automobile, as practiced in the metallurgical inspection department of the Buick Motor Division, is a high speed grinding wheel and a pair of sharp, highly trained eyes. These, and long experience in the study of the various types of sparks thrown from the whirling wheel when brought in contact with different types of steel, make it possible for him to tell within close limits, what is the carbon content of a steel bar, how one steel differs from the other, or tell with comparative accuracy the alloy content of the metal.

This skill in being able to distinguish one type of steel, from the other, detecting small variations from specifications, has eliminated many errors. The expert can tell by the sparks whether it is king bolt stock, steel for

1. In checking specifications, the operator carefully watches and determines the carbon and alloy content of the steel by noting the shapes of sparks, the length of the spark stream, and the color.

2. A portable grinder provides a handy method of checking steel rods in stock by the spark method to prevent any mix-ups in manufacture.

transmission gears, or high carbon steel used for spring clips, washers, and so on.

According to the plant technicians, spark testing is of great value when steels are used in large quantities and of varied chemical analyses. The spark test is fast, mobile, accurate, and is adaptable to the finished part as well as rough bar stock. It does not replace chemical analysis, but rather is used in conjunction with chemical analysis as a plant-wide inspection practice. The test is made by bringing a high speed grinding wheel against the steel in question and examining the spark stream for characteristics that may be interpreted in terms of approximate percentages of the chemical elements present.

Carbon, molybdenum, silicon, nickel, and tungsten have characteristic sparks that may be recognized easily in the spark stream. The presence and amount of carbon is most readily evaluated in the spark test. In steels up to about 30 per cent carbon, the test is accurate within plus or minus .02 per cent with a skilled operator.

At the Buick plant, spark testing is used for the sorting of steels, for detection of bars of foreign analysis in lots of steel, and for fast approximations of the chemical analyses of the steel. Where the analysis of a steel is unknown, a fast and fairly accurate estimate can be made by comparing the spark stream with sparks from bars of known analyses.

Spark testing may be considered an art, and the use of the test with a high degree of accuracy depends upon the keen visual perceptions of the operator. This is especially true, according to the technicians, in checking steels where there are slight differences in analyses. The spark tester must watch conditions in making the test. The selection of the spark testing wheel, the speed of the wheel, and the pressure with which the wheel is brought against the steel, are all important in producing a spark stream that is easily and accurately interpreted. Spark testing is carried on preferably in a darkened area, since

3. Spark stream of SAE 1070 High Carbon Steel having 0.65 to 0.75 per cent Carbon content, the stream being characterized by its bushy appearance and the presence of numerous bursts and spurts.

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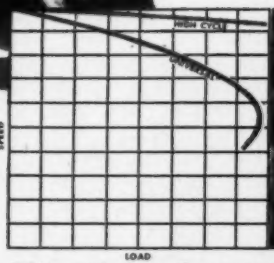

This graph shows the comparison between the performance of High-Cycle and universal types of tools. Note that the free speed of High-Cycle tools is much higher and that the speed drops only about 5% under load. Result: faster production.

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any light makes the examination of the spark stream more difficult. The most important requisite is the ability of the operator to interpret the characteristics of the shower of sparks in terms of percentages of chemical elements present in the steel. In comparing steels of greatly differing analyses, the characteristics of the spark stream will show a vast difference. In steels of only slightly differing analyses the differences in the spark stream are not so clearly defined and the test requires experience and skill for accurate classification.

4. Spark stream of SAE 1050 steel, having 0.45 to 0.55 per cent Carbon content. This stream is similar to that made by the High Carbon stock, but has fewer bursts.

Sparks from the grinding wheel are in reality small chips of the metal flying off at sufficient temperatures to illuminate them or make them glow. Some spark streams are long and spike-like, while others are bushy and full of bursts, depending upon the types of steels. It is a theory that the sparks or spurts are due to the rapid formation of gaseous carbon oxide below the surface of the chips or globule of

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molten steel. Sudden escape of gas from inside the globules causes them to explode.

Carbon seems to be a necessary element for the spurts or bursts. Some soft, non-ferrous metals, such as copper or aluminum, give no grinding sparks in the air. Pure iron has very few spurts while low carbon machine steel, yields a few plain forked spurts. As the carbon content increases in plain steel, the explosions increase and assume intricate patterns. They are so profuse in high carbon steel, that the spark stream becomes very bushy and particles from the initial explosions dart out and repeat with secondary bursts, producing a branching network of light.

High speed steel is easily identified. Dull color near wheel and long length of the work stream are characteristic. Manganese steel yields a stream of high temperature and great brilliance, while sparks from chromium steel, though similar to those of high speed steel, are of less brilliant color near the wheel and the stream itself is thinner.

5. Spark stream of SAE 1010 Low Carbon Steel, having a carbon content of from 0.05 to 0.15 per cent, the stream being thin with few bursts.

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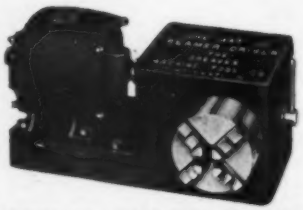

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Among major activities in the spark testing routine at the Buick plants are the 100 per cent testing of all transmission gear stock to insure the proper selection of steel to avoid any possible mix-up; also of all 1335, X1335 and X1340 steel, because this stock is used in bars of the same diameter and the spark test prevents mistakes in its use. Valve rocker arm shaft steel is sparked as a check against the chemical analysis. A percentage of all washer stock is tested to maintain the specification on carbon; tool steels of high speed variety are spark tested for alloy content; and a certain percentage of 1020 rivets and a percentage of torque tube stock are tested.

One of the most important uses of the spark test is in connection with the king bolt stock. The physical properties of the king bolt are vital to the car's safe operation. The part is carburized and demands a soft-tough core. The spark test is applied in every case to insure against the possibility of any high carbon steel being used.

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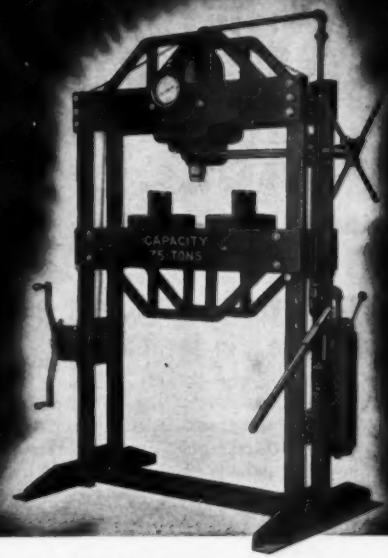

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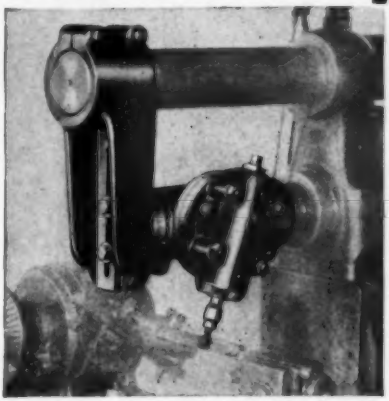

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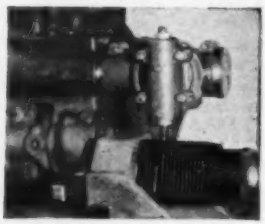

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Some Present Machine Problems

By J. E. BULLARD

MACHINE builders have been facing a situation which promises to become increasingly serious. The nation has awakened to the fact that it is unprepared, and more than ever in the past, needs to prepare for defense. Being unprepared is nothing new for the United States. Its people are peaceful. They do not believe in great standing armies or a navy larger than is necessary to preserve peace. They have always considered it better policy, from every point of view, to raise the standard of living of the average person than to spend huge sums of money in military preparedness, so long as there is no threat of attack by an aggressor.

Unpreparedness, therefore, is a normal state of affairs. In the past, the world has envied our powers of production. We have designed, built and used the best machines. We have replaced perfectly good machines, long before they were worn out, with units which served the purpose better. Some of our industries, such as the automobile industry have been able to pay the highest wages in the world, yet produce motor vehicles at such low costs that they could be sold in competition with cars produced in low wage nations. Our normal course is a steady increase in production capacity.

For the past 10 years, this course was not followed. As a result, when it becomes important that war and defense production be geared into high, there is a sad lack of machines, of buildings, even of the materials required to build the machines. This is far from a normal condition. In no other decade during its history has there been such stagnation, such a failure to grow, to expand, to install new machines in our producing plants. Never before has our producing capacity been so completely unprepared.

The situation, however, is not so grave

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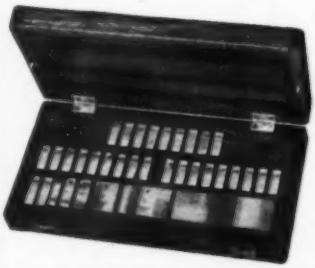

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so long as there remain the resourcefulness, the ingenuity and the determination which have made this nation great. It is true that these 10 years of stagnation have resulted in a serious shortage of skilled and experienced workers in all industries, for even normal production. Industry seems called upon to carry on a fight against what appears to be almost overwhelming odds.

Yet, the picture is not so dark as it might seem. There may be a silver lining. Obviously, the machine designers hold the key to the situation. If there are not enough skilled and experienced workers, it follows that less skilled and experienced ones will have to be depended upon to do the work. Such being the case, machines have to be designed and built which will turn out more and better work, with less skill on the part of the workers. Machines can be designed and built in less time than inexperienced and unskilled persons can be given the training which will make them as deft as the most highly skilled. The solution, therefore, lies as much in machines as it does in teaching individuals and giving them experience.

Already, much has been accomplished in this direction. One of the reasons we have been able to buy such good cars, at such low prices, is because machine designers have provided machines which supplanted skill of the workers. To build a present day car in an old fashioned machine shop would cost many times as much as it does to build one in a modern automobile factory.

To-day, more and more attention has to be given to designing all machines, so that the least possible skill and experience are required of the operator, and the products are better than ever in the past. Few machines built during these next critical years are going to be operated by old time, highly skilled and experienced mechanics

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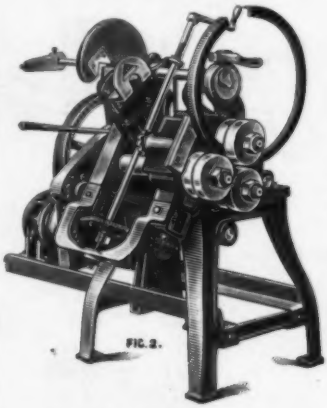

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anyhow. Too many will be operated without the close supervision of men who are highly skilled and have had long experience. This must be fully considered in the designing.

It is not enough to consider the new machines alone. The eventual demand will be so great that there are not enough mechanics, there is not enough producing capacity and it remains to be seen whether there will be sufficient materials to build enough machines to approach the need.

One answer is to devote more and more attention to modernizing machines that are still in use, perhaps taking the machines back to the factories and rebuilding as required. Although there is a high degree of obsolescence in installed machines, there is a still greater obsolescence of labor. Actually, we do not have enough thoroughly skilled and experienced machine operators to operate the machines now in use. This is so because production has remained sub-normal for so long. A lot of the old machines now in use need changes to simplify operation.

Under normal conditions, the sensible course would be to replace all these old machines with new ones. However, in the scale of operation forecast, it simply is not going to be possible to provide all the material, and all the mechanics necessary to build new machines in the required numbers.

Re-examination of old designs, of machines which are still being used, is in order. Some of these old machines will prove hopeless. Nothing which can be done will make them modern again except melting and using the metal for building entirely new machines. There are others which will justify rather complete rebuilding. Still others can be made to serve the purpose by adding certain new parts. Just what may be done in the way of transformation can be learned only after

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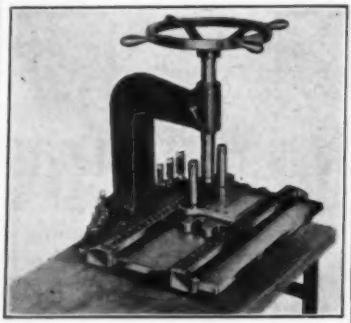

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studying the old machines critically in the light of present day requirements.

The problem is to change these machines in such a manner as to speed up their production, improve their output and make them sufficiently automatic and foolproof in operation so that the minimum of skill and experience will be required on the part of the operator. It is a problem which can be solved in this nation, if it can be in any other part of the world, for the simple reason that here we possess the originality, the ingenuity and the genius to do it, to a higher degree than it can be found elsewhere.

This, however, is but the first step. Under present world conditions, we must become so strong at production that we can build, in the shortest possible time, a defense so powerful that no nation or combination of nations will dare attack us. We can do it and we are one of the very few nations in the world which can.

Wars are not a perpetual world condition. Warfare exhausts people and nations. Whether or not there is decisive victory on the part of any belligerent, the time comes when there is no energy left for fighting, when there are no more material resources with which to carry on the war. So, there must be peace.

In so far as this future peace era is concerned, it may prove fortunate we have found ourselves in the present situation. For the purposes of warfare, if for no other, more and more nations have increased the efficiency of their industries and multiplied their industrial capacities. Many of these nations are using the best and the most modern machines ever built in the United States. After the war is over, these nations are almost certain to be impoverished. They must speed up production. They are going to use their industrial capacities for turning out peacetime products with which to flood the markets

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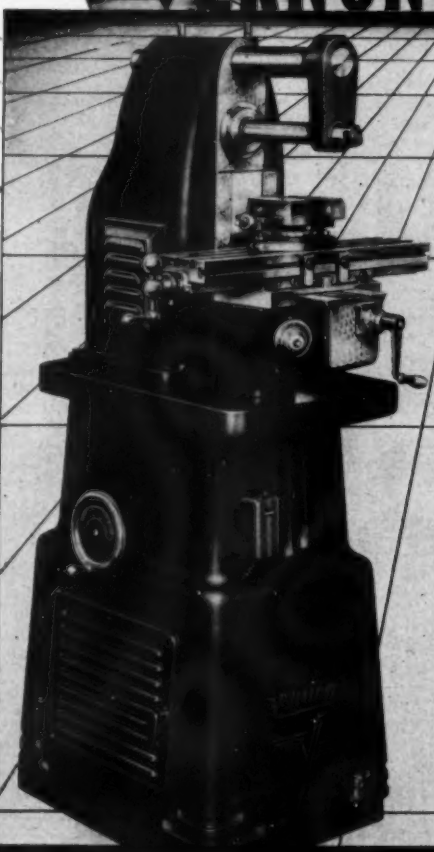

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of the world. It is quite possible that long hours and low wages will be the lot of workers in these countries. There is just one way we can meet such competition and still maintain our high standards of living. That is by designing and using better and better machines.

To meet the present difficult situation, we must design and build exactly the same kinds of machines we must have when peace returns to the world. Were we not faced with the critical conditions now before us, it would not be so necessary to start designing such machines now. What we must have now is machines which will make it possible to increase our production many fold with the labor available. Those machines must produce better than machines have in the past. If we do not have such machines we cannot complete our defense program in time. We may be driven into a war before we are prepared, and because we are, we may lose that war. The future, then, will be very dark, indeed. If we can design and build the right machines now, we need not worry about defeat in war or in peace. Instead, we may look forward to an era of greater prosperity than we have ever known before, to higher and higher standards of living.

What our future will be, therefore, depends upon how well the machine designers and the machine builders solve the problems which face them now. Judging from the past, there should seem to be little reason to worry about what that future may be.

Photoelectric Relay Bulletin

An inexpensive General Electric photoelectric relay is described in Bulletin GEA-3533. The relay, complete with the accessories needed, is shipped as a package. The manuacturer declares that it is not necessary to buy extras or hunt for special materials.

The outfit is made up of six units—relay, light source, transformer, lens, etc. These units are offered in various combinations which make it possible for the user to select an outfit adapted to his needs.

The "electric eye" has been so widely publicized that it is hardly necessary to refer to its various uses. Opening doors, controlling drinking fountains, counting customers, and counting pieces produced in factories are but a few of its many applications.

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● Steel construction throughout . . . Positive quick-acting air control valve. Operates on air pressures of 40—100 pounds. The *only* hand grinder with spindle speed of 100,000 R. P. M. on 100 pounds air pressure.

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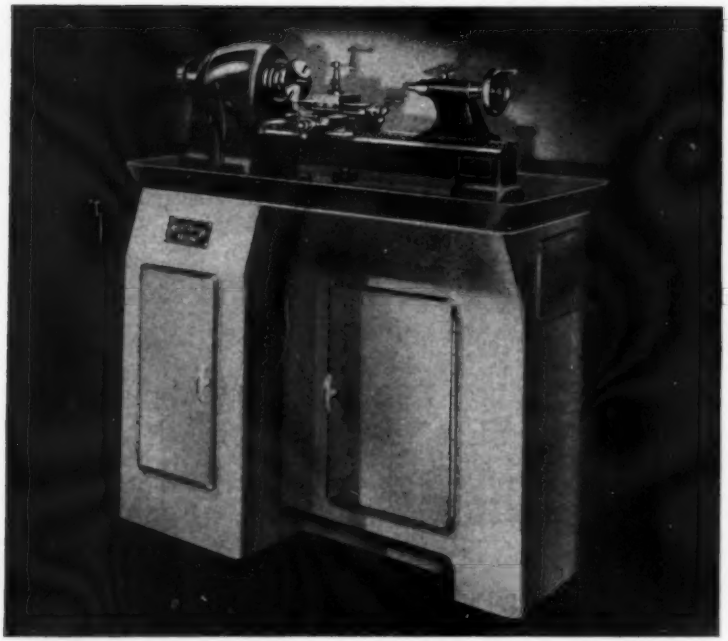

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Substituting Molybdenum

By R. EDSON EMERY*

PRESENT world conditions have compelled the use of substitutes in a great many steel grades, such as the substitution of Molybdenum for Tungsten in alloy steels containing a large percentage of Tungsten. This substitution is, of course, necessitated by the scarcity of Tungsten alloy, and the moment is fast approaching when the use of the old standard type of 18-4-1 High Speed will be restricted to certain specific applications where no substitute can be accepted. Tool manufacturers throughout the country are going to change, and are rapidly changing over to the Molybdenum-Tungsten Type of High Speed Steel and other variations of this analysis.

There has been some reluctance on the part of a great many tool makers to use the Molybdenum types of High Speed Steels. This has been due to the fact that lack of knowledge and practical experience has led tool manufacturers to be somewhat doubtful of results obtained. Naturally, when the amount of labor involved and the cost of manufacturing the tools is much more than the value of the steel itself, this lack of knowledge has led the manufacturers to doubt the ability of this steel to make tools of sufficiently high quality to give the results normally obtained through the use of standard High Speed Steel. Lack of proper hardening equipment has also contributed to this reluctance to use Molybdenum-Tungsten High Speed Steel, particularly on the part of small tool makers.

However, this reluctance is being overcome rapidly, and much credit is due to the Cleveland Twist Drill Co. for their advertising campaign and their continual development work, which has done much to overcome this lack of knowledge and experience.

Undoubtedly, Governmental restrictions will force the wider use of Molybdenum High Speed Steel than heretofore, and the available Tungsten will naturally be apportioned to individuals and to such items as really require use of this alloy.

In changing from the 18-4-1 analysis to the Molybdenum Type of High Speed, there are certain precautions which must be taken, since it is commonly known that the Molybdenum Type of High Speed Steel decarburizes faster than the 18-4-1 type. This, of course, can be overcome to a certain extent by allowing a larger tolerance for finish grinding and machine work after the hardening operation.

The Molybdenum Type of High Speed Steel hardens at slightly lower temperatures than the 18-4-1 analysis, as outlined:

*President, Jessop Steel Co., Washington, Pa.

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18-4-1

Preheat at 1500 deg. F.
Harden at 2300 deg. F., in oil or air.
Temper at 1000 to 1125 deg. F.

Molybdenum type H. S. S.

Preheat at 1500 deg. F.
Harden at 2200 deg. F.
Temper at 950 to 1100 deg. F.

The general shop practice is the same with both types of steel, as care should always be taken in working with expensive steels. Such steels require care in hardening, machining, etc. However, the Molybdenum Type of High Speed Steel offers no trouble whatsoever to an intelligent and experienced tool hardener who will follow proper instructions for heat treating.

The Jessop Steel Co., manufactures a Molybdenum Tungsten Type of High Speed Steel under its brand name of Mogul in conjunction with the Cleveland Twist Drill Co. patents. There are several variations of analysis which can be recommended by Jessop's metallurgical department for particular applications.

Jessop also offers another grade of steel of the cutting tool type, which has been very successfully used for fast, fine cutting operations. This grade has been steadily improved over a period of years through actual experience in the cutting of metals and is a grade which also conserves Tungsten, in that this grade contains approximately 4% Tungsten combined with other alloys in a balanced analysis suited for its particular application.

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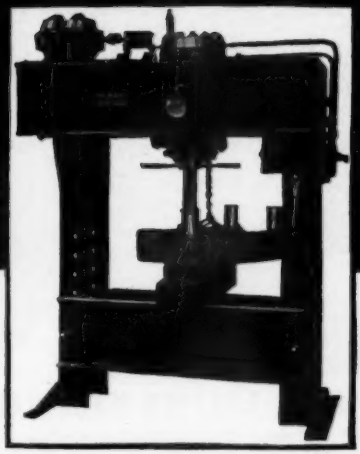

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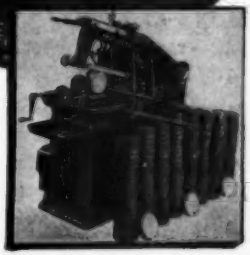
RACINE
METAL CUTTING MACHINES



RACINE Metal Cutting Machines nine abreast in battery formation above are cutting oval tool steel stock four pieces at a time, day in and day out. Such production cutting with close accuracy and minimum blade wear make this Cut-Off Department an economical unit in this mfr's. production story.

Competition is keen in this field and costs are of prime consideration. Their high cost material must be cut quickly, accurately, and at an acute angle with a minimum of waste. With RACINE Shear Cut positive progressive screw feed saws they needed no guess work in figuring their costs on this operation as each cut is made in exactly the same length of time—guaranteeing production. Uniform accuracy – low blade cost—guaranteed production is *Controlled Cutting* and *Low Cost of Operation.*

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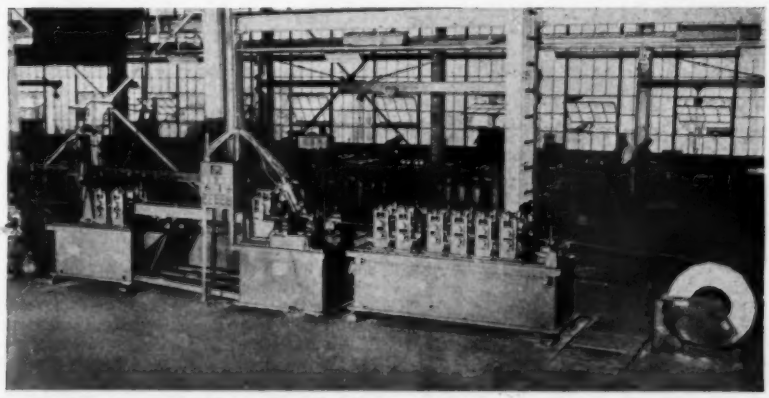
Automatic Tube Welding

By PAUL ANDERSON

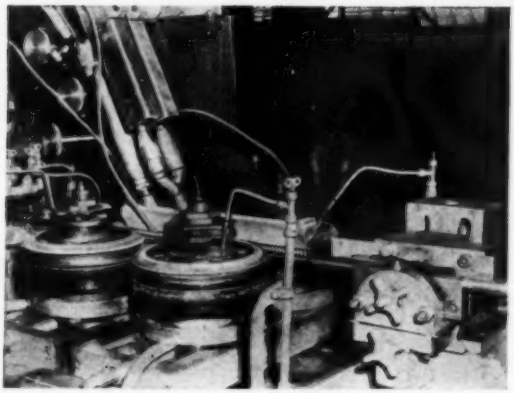
TUBING can now be continuously welded from low-carbon, stainless and other alloy steel skelp at exceptionally high production speeds with a new automatic oxy-acetylene tube-welding machine. This machine contains many new features and was developed by The Yoder Co., Cleveland, in collaboration with The Linde Air Products Co., New York.

Oxy-acetylene welding provides a high-speed method of welding stainless steel tubing with uniformly good quality welds. With this new machine it is claimed possible to produce high-quality, continuously welded stainless steel tubing at low production cost. The gas welding method is also unique in that it can successfully produce tubing from unpickled, hot-rolled stock for which there is considerable demand in the manufacture of low-cost items such as automotive exhaust tubing, conduit tubing, and structural tubing on which a smooth, polished finish is not necessary. Other tube-welding methods have not proved satisfactory on this type of material.

The cost of oxy-acetylene welding of cold-rolled, low-carbon steel tubing compares favorably with operating costs of other methods of welding steel tubing. However, the oxy-acetylene method now offers the additional ad-

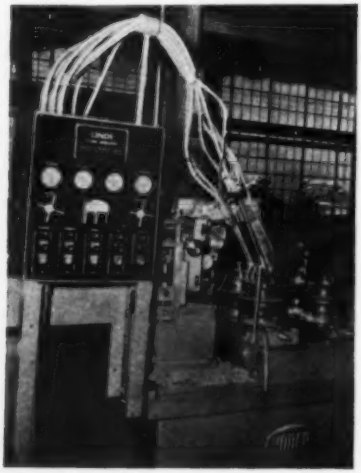


1. Flat steel skelp is fed into machine, automatically formed into tubing and oxy-acetylene welded at high speeds.



2. The tubing is welded by a combination of intense heat from a multi-flame welding head and pressure exerted by four guide rolls.

vantage of greater possible welding speeds. For example, it is stated that 18-gauge material can be welded at speeds up to 150 feet per minute, and heavier materials at comparable speeds, as indicated in the accompanying table.



3. Oxygen and acetylene supply, and the operation of the blowpipe and drive motor are all controlled at a central panel.

Since the oxy-acetylene weld is continuous, the only limit to the welding rate is that imposed by such mechanical factors as those of cutting off and handling the material. Consequently, it is reasonable to assume that further developments on handling these factors will eventually bring about even greater oxy-acetylene welding speeds.

The forming-mill section of the new tube-welding machine is similar in construction to previously designed tube-welding machines. The flat skelp is fed in from a coil through a series of forming stands powered through a worm-gear drive mechanism which assures an even feeding action at exceptionally high speeds.

The welding table section of the machine contains several new features which make possible the high speed of welding. Heat is supplied from a new type multiple-flame Oxweld duplex welding head which is said to require 25 to 30 per cent less acetylene per foot of weld, and 5 to 10 per cent less oxygen per foot of weld than welding heads previously used. Separate oxy-acetylene supply lines are provided for the welding and for the preheat flames. The supply of these gases is automatically controlled through new type regulators which are extremely sensitive and provide steady working gas pressures. Regulator adjustments are made

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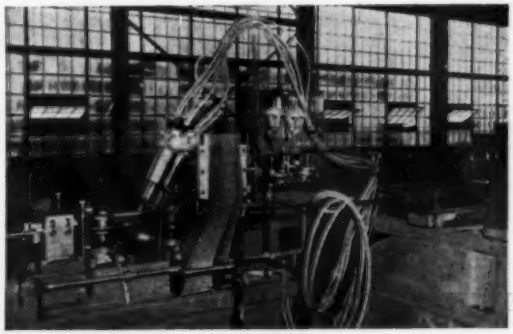


4. Rear view of the control panel shows the oxygen, acetylene and cooling water supply lines, and the electrically and pneumatically controlled valves.

at a conveniently located control panel. Provision is also made at the panel for push-button control of the welding blowpipe and the drive mechanism of the machine. Advantages claimed for the new machine can be summarized:

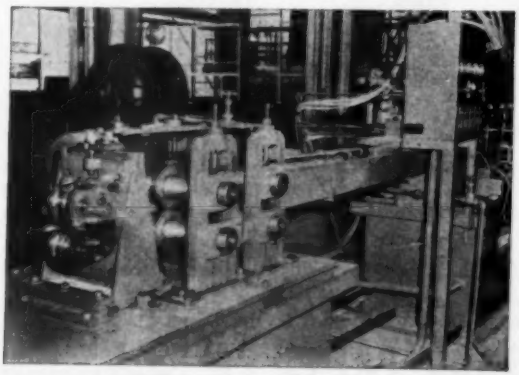
1. Tubing can be oxy-acetylene welded at speeds ranging from 30 to 150 feet per minute, depending upon the thickness of material.

2. Actual operating cost per foot of oxy-acetylene welded tubing is comparable to other methods, but the cost of the complete oxy-acetylene welding installation is less than that of installations required for the application of other methods of continuous tube welding.

3. Tubing of stainless steel can be welded by the oxy-acetylene method at speeds in excess of 50 feet per minute.

4. All that is necessary to produce maximum-quality welds in tubing formed from unpickled, hot-rolled stock is a slight increase in the unit consumption of both oxygen and acetylene over gas quantities required for cold-rolled steel.

5. In addition to plain carbon cold-rolled and hot-rolled steels, and stainless steel, the new machine will successfully handle a wide variety of alloy steels. Since one tube-welding machine can turn out over 12,000,000 feet of tubing per year, the additional versatility of the unit makes it possible



5. After it is welded, the tubing passes through a water quench trough and then through a set of rollers which straighten the tubing before it is cut into lengths.

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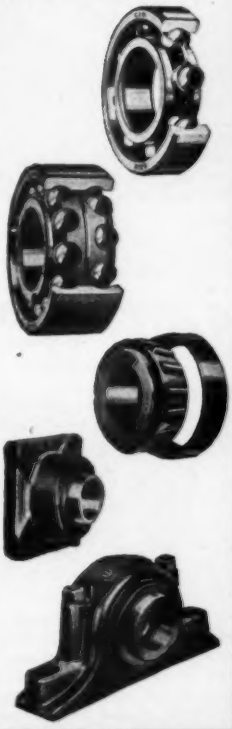

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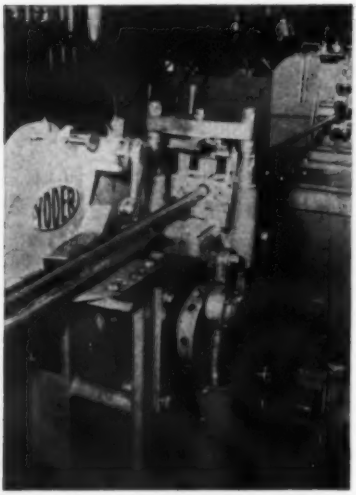

6. The welded tubing, cooled and straightened, is cut into the desired lengths by means of this automatically operated shear.

7. The weld on this section of tubing is exactly as produced. Usual practice, however, is to remove the slight weld reinforcement with a cutting tool placed a short distance after the welding flames, thereby making the seam practically invisible. Note that the weld withstood the crushing at one end and the diameter expansion at the other end without failure. Reinforcement on inside of the tubing is considerably less than that shown on the outside of the sample.

for the manufacturer to spread his depreciation cost over a larger variety and a larger volume of products with resulting lower costs for each.

TABLE OF OPERATING SPEEDS

Wall Thickness B.w.g.	Speed Range, ft. per min.
14	30-100
16	40-140
18	60-150
20	100*

*Note: This value limited by mechanical facilities for controlling the lightweight skelp.

Illustrations—Courtesy The Linde Air Products Co., New York, N. Y.

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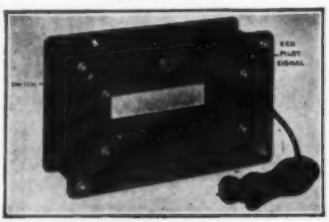
A TOOL ROOM NECESSITY



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Cutting Tools in "Slow Motion"

STUDY by means of high-speed photography to determine what takes place when metal is cut on machine tools was recently made by General Electric's Engineering Department and Works Laboratory. By the use of high-speed film, the engineers were able to see what takes place at the cutting edge of a tool operating at normal cutting speeds. The high-speed camera caught every detail, magnified it, and then slowed the action to 1/60th of normal speed so that a detailed study could be made.

These studies were made to determine the correct cutting angles for cutting various materials, and to study the irregular cutting action of tools due to any mechanical defects in the machine tool itself. This was determined by studying the chip action as influenced by various rake and clearance angles on cutting tools such as lathe and planer tools and milling machines. A study was also made of the effect of various liquids on chip flow.

The first experiments were made by using a planer and milling machine for cutting steel, cast iron, and brass. The work piece was in the shape of an angle iron, making it possible to control the chip, and allowing the camera to be focused at a point giving the best view of the chip action.

The front of the block was inscribed with both vertical and horizontal lines 1/32" apart. In this way, the distortion of the metal was identified in both the chip and the work piece under the cut.

It was discovered that when a cut is made with a milling machine, each cutter tooth puts increasing strain on the arbor (shaft) as it progresses. This causes the arbor to wind up. As the tooth emerges from the cut, this energy in the arbor is released, causing the cutter to spring forward an amount depending usually on the extent of contact of the subsequent tooth with the work. There ensues a short pause until enough pressure at the tooth is built

Camera and lights as set up for high speed photography of planer tools in action.

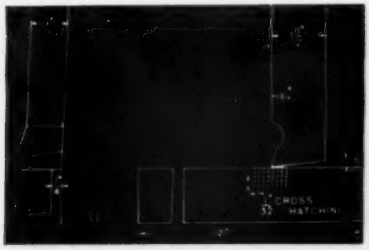
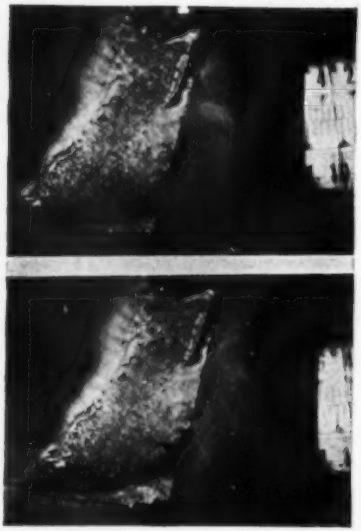


Diagram of work piece and cutting tool showing vertical and horizontal lines on work piece.



A tool with a 16° top rake cutting mild steel. Here are two pictures from a group which showed parting of metal ahead of tool and its distortion as indicated by the scribed lines.

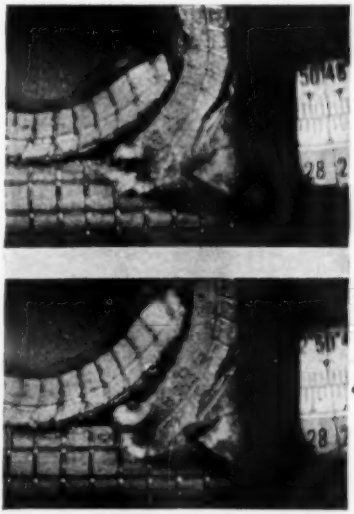
up to cause it to continue on its way. For the heavier cuts, this action was more pronounced and was observed as chatter. All of this action was caught by the high speed camera.

It was found when machining steel with a tool having a blunt rake angle, the chip is crushed and areas bounded by the lines on the chip are in the shape of oblongs while they were square on the block. With a greater rake angle, the chip is rolled up with less crushing action and the areas remain approximately as square as on the chip.

In the case of cast iron, the pieces are generally broken off without distortion because of the nature of the material. With a heavy cut there are many pieces of about the same dimension in all directions equal to the depth of the cut. Breaking of these pieces ahead of the tool results in a rough surface directly in front of it. In passing over this surface, the tool removes many smaller pieces. Also the abrasive action breaks off many small pieces as the large pieces are removed.

In the case of brass, chips are compressed at the bottom into shapes resembling wedges. As these move out, pressure on the tool is relieved somewhat, causing it to spring forward and thus move the chips out at a higher rate than if deflection of the tool were negligible. Perhaps this may account for the fact that when turning brass at a high cutting rate, the operator often feels chips striking him with considerable velocity, which is not so noticeable with other metals.

Starting a cut, it is possible to observe how the tool is deflected in the direction of travel of the metal, when it makes contact, until sufficient pres-



Altering the rake angle to 24° and still using mild steel on the planer results in less distortion of metal ahead of tool and smoother chip flow. Upper section shows chip curled back inside itself.

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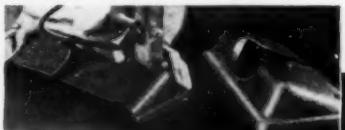
Available in various lengths. Each comes in a metal box, with a slot for saw to be pulled out and cut off as required.

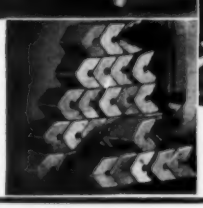
Send for Booklet — Actual Performance Records of DoAll Saws

THE DOALL COMPANY

1206 Thacker St., · Des Plaines, Ill.

Associated with Continental Machines, Inc., Minneapolis





32 dies exactly alike 1¼" thick of oil hardening tool steel, sawed in 23½ hours.

Typewriter covers notched out in 5 minutes each. Formerly took 30 minutes to drill and file.

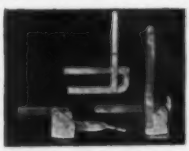
Parts for dies made at C. A. Weidner & Sons, Rochester, N. Y.

sure has been built up to start the cut. Approaching end of cut, there is decreasingly less metal ahead of tool, resulting in a section at end of block which gives way in a manner somewhat different from that in which the metal removed earlier was taken off. The material removed at the end often extends somewhat below the surface of that which is removed some distance from the end. This occurs because of changes in the forces acting within the block. When cut is some distance from end of block, there is sufficient metal ahead of tool to take the compression. As end of cut is approached, metal to take this compression exists only up to end of the block. At the very end of the chip, forces involving shear and tenison become increasingly important, causing the chip at this point to differ somewhat from its nature some distance from the ends.

By the use of the high-speed film, engineers, machinists, and others interested in the efficiency of metal cutting are now able to see what takes place when the metal gives way at the cutting face of a tool—action too fast for the naked eye to see.

Yoder Boring Mill Bulletin

A bulletin on their new improved No. 3 horizontal boring mill is announced by the Yoder Sales Co., Cleveland, Ohio. It contains a large, clear photograph of the machine along with full details.



PECO

TIME SAVING CLAMPS

PECO CLAMPS save both time and money. Can be used on jigs and fixtures in hundreds of ways at a fraction of the cost of individually designed clamps. Line includes strong quick-acting Drill Clamps, Jig Draw Clamps, Knife Clamps, Toggle Clamps and Jig Cam Clamps. Send for illustrated folder.

PRODUCTS ENGINEERING COMPANY
700 E. Florence Ave. Los Angeles

Here is a planer tool working on cast iron, revealing the greater fragmentation of this material. Tool deflection is indicated by the pointer. Action was slowed to 1/60th of normal speed in these pictures.

Put the
IMPORTANCE
on the SHAFT!

DEPEND ON

STOW

FLEXIBLE SHAFT MACHINES

Rush production cannot wait—that's why you need a shaft that can stand up to the toughest grinding, sanding, drilling, wire brushing. Now, more than ever before, Stow's rugged, heavy-duty flexible shaft machines are helping hundreds of shops meet orders on time—turn out more work in a full day's schedule.

You can depend on Stow's quality—backed by 66 years' experience in manufacturing flexible shafts—to take the brunt of day-in-day-out operation ... on all of the 101 jobs a Stow flexible shaft machine will do. Stow makes heavy-duty flexible shaft machines in 14 models for various applications, with shaft size, power and speed designed to meet your particular need.

New STOW Junior Line begins at $35.00

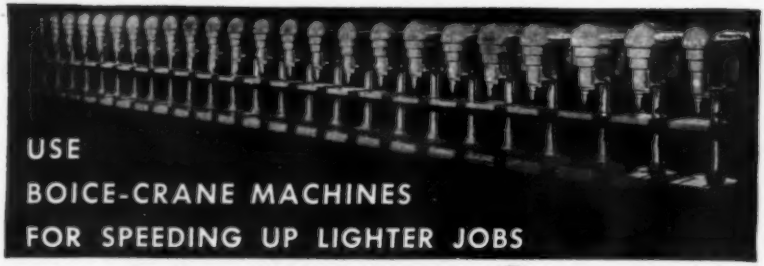
Designed for general utility work, this economical line offers notable quality features.

Write for complete STOW catalog NOW!

STOW MANUFACTURING CO., INC.

30 SHEAR STREET **BINGHAMTON, N. Y.**

Established 1875 *Inventors of Flexible Shafts*



USE
BOICE-CRANE MACHINES
FOR SPEEDING UP LIGHTER JOBS

Write Today FOR THESE 2 FOLDERS ON THIS DELIVERABLE PLANT EQUIPMENT

Dependable delivery on Boice-Crane tools—often only a matter of days—never over a few weeks. Why wait 6 to 12 long months for big, heavy, costly tools that never can handle light jobs as efficiently anyway? Oughtn't you get our literature too and start tooling more light drilling, tapping, and cutting jobs this quicker, cheaper way?

***Folder No. 1** lists over 60 Boice-Crane Drill Presses to ⅝" and Tappers to ½" capacity. No. 2 covers our 8-speed All-Purpose Band Saws.*

They Tell You How To Keep Your Big Machines Free For Big Work

The most logical thing in today's forced production is to use your large, hard-to-replace machines on large operations only. Load the smaller jobs on lighter, speedier, less costly **and** easier-to-get Boice-Cranes, and the benefits double up. Get more out of your big machine—and the EXTRA saving of running the lighter jobs at reduced cost on a machine designed especially for that class of work.

The Boice-Crane 8-Speed Band Saw Cuts Everything

The new Boice-Crane is the perfect small band saw for production, tools, dies, foundry and experimental work. 8 speeds cut many materials. Powerful gear drive.

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BOICE-CRANE COMPANY 1729 NORWOOD AVE. TOLEDO, OHIO

Orders Via O. P. M.

By AL BERNSOHN

BUSINESS has done a flip-flop. Yesterday the emphasis was on sales. Today it's on production.

Factories that recently worked a quiet, one-shift day filling civilian requirements now keep machines screaming throughout 24-hour days, aiding the military race against time. Officials struggle to increase speed, to lower production time.

Other plants, that once were busy, suddenly find themselves faced with a raw material shortage, often of alarming proportions.

It's thrown many shops out of kilter.

Defense Contract Service of Office of Production Management is straightening out a sizeable part of the mess by (1) helping the fellows who are suddenly overloaded with work to find sub-contractors capable of relieving them of some of the strain and (2) helping quiet plants to obtain enough priority-rated business to get things humming again.

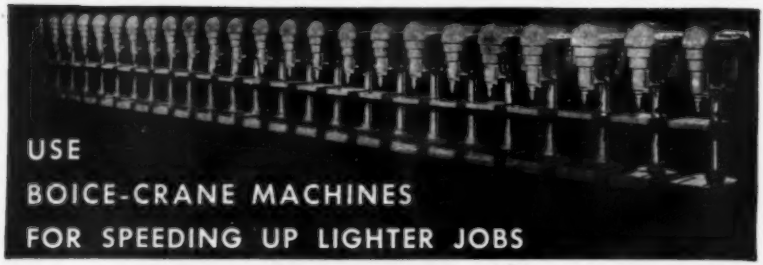
Actually this federal organization provides facilities for making defense items on prime and sub-contract bases. In practice, this means that to prime contractors' attention are brought subcontractors who can (a) stymie bottlenecks by handling the time-taking parts for prime contractors, (b) lower cost by using machines they already possess, whereas the prime contractor would have to make special purchases of them and (c) augment prime contractors' equipment by functioning as tantamount to part of the prime contractors' organizations, permitting them to handle more of the major contracts. Thus do some plants, facing danger of a shut-down because of no raw materials, rise to activity, keep their organizations in operation and fulfill an essential military function.

The model Chicago branch of OPM's Defense Contract Service was interviewed to learn just how the metal-working factory men can benefit from its work. Other branches may be found wherever capillaries of Federal Reserve banks are located. All perform similarly, though not identically.

The Navy and certain Army purchasing units send copies of invitations to bid on requirements to the offices. Blue prints, specifications and the like are included. They're available for examination by interested firms.

Information about items on which bids are open, or manufacturers needed, is listed in a bi-weekly mimeographed bulletin published by the Chicago DCS branch. First it lists manufacture for which sub-contractors are wanted. This list is followed by a summary of prime contracts on which bids are being received.

This order of listing indicates the weight OPM is placing on sub-contracts. If a couple of days can be hacked off production time, deliveries are that much sooner and our present



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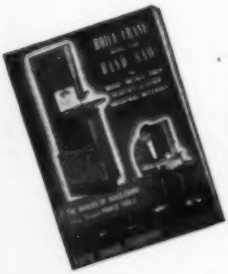

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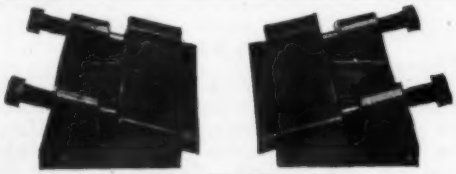
armament program is that much further ahead. For example, an important part of a bomb hoist required a certain type of expert machining. The contract holder was struggling along trying hard not to have to admit that production requirements simply were too large for his own plant. In stepped an OPM official. He analyzed the plant's requirements and trouble. Soon he'd found a sub-contractor willing to handle part of that machining job at a price in line with the prime contractor's. The manufacturer fulfilled his obligations ahead of time, obtained further orders, and was saved his entire performance bond. The sub-contractor was kept busy even though his own equipment was not sufficiently diversified to handle a prime contract.

The regularly printed bulletins are sent to Chambers of Commerce, manufacturer's associations, defense councils, newspapers and banks in the Seventh Federal Reserve District. They're for circularization to all interested manufacturers in the locality of the recipient of the bulletin. They announce that available drawings will be photostated and sent to prospective bidders, unable to visit the OPM office, on a C. O. D. basis.

At first it was difficult to persuade manufacturers to list sub-contracts. They figured that their plants had been shut down for a long time. Here was a chance to make a little money. Why slice it up? A brake on the availability of new machine tools, a few close shaves on meeting delivery dates, a little "moral persuasion" and soon these manufacturers found that their best interests lay in spreading the production work a little thinner. It came in more consistently that way. Now the lists of sub-contracts may run to three or more pages.

OPM has as its objective, the putting to work of all machine tools capable of defense work 24-hours a day, seven days a week. This certainly can't be



HART'S

Divided Machine Vises

These Vises will hold work the full length of the table, if necessary. Useful on planer, milling machine, surface grinder or drill. They adapt themselves to any shape and can be used on sides of table as well as ends. The Jaws are tool steel and hardened, the angle holding the work down on the table.

Size of Base	**5x7 inches**
Size of Jaw	**3x6 inches**
Height at highest Point	**2¼ inches**

When writing for descriptive circular kindly mention the BLUE BOOK.

HART MACHINE CO.

26 Mather Street, · Dorchester, Boston, Mass.

HART'S

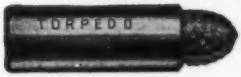
Milling Fixtures

These fixtures will make themselves popular and profitable in your shop. Easily kept clean to receive the work. May be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. Grip holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes—¾" to 4".

ELIMINATE THE MYSTERY
IN YOUR DIAMOND PURCHASES

BY USING **WILLEY'S**
TORPEDO TYPE
WHEEL DRESSING
TOOLS

Cut Costs 50 to 60%



THE TORPEDO TYPE WHEEL DRESSING TOOL, consists of many layers of natural whole diamonds scientifically spaced and embodied in a matrix of Tungsten Carbide, the best holding medium known for setting diamonds. Thus the **TORPEDO TYPE DRESSER** requires no remounting. To obtain new cutting surface, give holder quarter turn at intervals.

No.	QUANTITY PRICES				WHEEL DIAMETER
	1 - 25	26 - 50	51 - 75	75 -100	
W-3	$11.00	$10.00	$ 9.00	$ 8.00	6 to 12
W-4	13.00	12.00	11.00	10.00	12 to 20
W-5	15.00	14.00	13.00	12.00	20 to 24
W-6	17.00	16.00	15.00	14.00	24 to 42

MORE AND MORE . . . CUSTOMERS ARE USING WILLEY'S TOOLS BECAUSE THEY STAND UP BEST

Manufacturers desiring to fabricate their own tools can obtain blanks in various sizes and shapes from our stock. . . . *Write for particulars.*

WILLEY'S CARBIDE TOOL CO.

1344 W. Vernor Highway, Detroit, Michigan

An "All-Out" Aid
FOR A
Dust
Defense!

CLEMENTS
CADILLAC
Portable Electric
BLOWERS & SUCTION CLEANERS

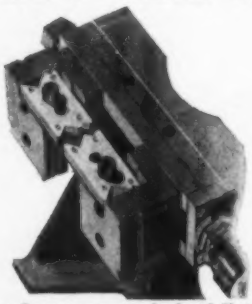
A Clements-Cadillac will be your mightiest weapon against breakdowns, costly delays, dust explosions and fire hazards.

MADE IN 5 POWERFUL MODELS

ASK FOR A 10 DAYS FREE TRIAL OFFER
WRITE FOR DESCRIPTIVE CIRCULAR
— TODAY

CLEMENTS MFG. CO.
6651 S. NARRAGANSETT AVE., CHICAGO, ILL.

"JOHN'S" DRILL JIGS



These Jigs are now supplied with Universal jaws for quick set-up for end drilling. Jaws are reversible and can grip ⅛" to ¾" depending on position of V's. Master jaws supplied with adapter jaws are another new development for quick tooling-up on jobs of almost any description. There are other important new features.

Write for bulletin giving full details.

HEUSER MFG. CO.
1638 N. Paulina St., Chicago, Ill.

accomplished at express speed. But it's certainly well on its way. There's a glut of some machines on the market. Others are like "hen's teeth." Most in demand are such tools as automatic screw machines, turret lathes, milling machines, internal and external grinders, horizontal and vertical boring mills, planers and such special machines as deep hole borers and thread grinders.

To ascertain what machines are in the shops and which shops hold the greatest promise as potential sub-contractors, the Chicago DCS branch has devised Form 31-5B Facilities Record. It provides a convenient means for the OPM to make a complete survey of each plant. It's only the rarest and most special of cases that requires a special representative's looking over the factory. More often a complete picture is obtained through these standard survey forms, 31-5B.

If your organization hasn't filled out a survey form, send for it at once and your chances of landing war-preparation business will be greatly expedited. The Seventh Federal Reserve District (and consequently OPM branch) covers all but the southern tips of Illinois and Indiana, all Michigan except the Detroit area, all but the northern tip of Wisconsin and all of Iowa.

The form employed in this area is known as a "Facilities Record." The form first identifies the place of business, its connections and officials. It learns the work the plant is doing and has done in civilian and military production, whether it is familiar with sub-contracting and the type of "Defense products" it could produce.

It checks on the nature, size and crane capacity of the factory buildings, how busy the plant is, skilled and semi-skilled labor employed and available, financial capabilities and needs of the factory and any additional information the factory officials care to furnish.

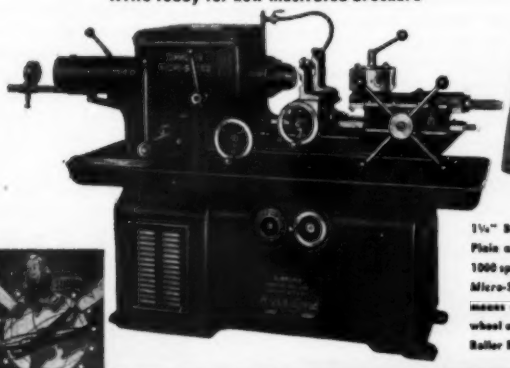
Now it's 20!

Several months ago, N. F. Vanderlipp, General Manager of Fairchild Aircraft Limited, Longueuil, Quebec, wrote: "We are operating eight SIMMONS NO. 2 MICRO-SPEED TURRET LATHES. They are doing well and we are extremely satisfied with their performance. They are being used in the manufacture of the Bolingbroke Bomber."

Today Fairchild has no less than twenty No. 2's on its production line! Here's concrete evidence of high-precision operation, repeated many times by others. We're producing them fast; you're buying them fast. And, best of all, you like them!

Write today for new illustrated brochure

QUICK DELIVERIES



1¼" Bar Capacity—14" Swing. Made in Plain and Back-Geared Types. A range of 1000 spindle speeds is available through the *Micro-Speed Drive*, all secured instantly by means of the Selector Dial Control handwheel on the cabinet base. Timken Tapered Roller Bearings. Spindle brake.

SIMMONS MACHINE TOOL CORP.

1725 NORTH BROADWAY, ALBANY, NEW YORK

NEW YORK CITY OFFICE 149 BROADWAY

First Manufacturer of Adjustable Limit Snap Gages in U. S.

A G D Standard

Plug Gages—Adjustable Limit Snap Gages
Adequate stock ready to grind to special specification
Priced on Cost—not on Demand

Jas. Clark - - Paterson, N. J.

Successor to

Jas. Clark Jr. Pneumatic Tool Co. and American Gage Co.

Key to the Facilities Record is the Machine List. Actual production machines hold the greatest interest here. Manufacturers are requested not to list such machines as tool grinders and portable drills. Foundry, heat treating and plating equipment are simply listed as being available and described but superficially. About the production machines, the list embraces:—number available, type, size, minimum tolerances, age, condition and complete specifications. Two conditions are all employed in the scale, "Good" and "Poor."

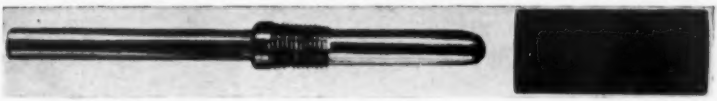
Jobs are analyzed for machine requirements and factories which have the right combinations of machines available and meet the other requirements of the sub-contractor, such as location, experience in certain manufacturing fields, etc., are referred to the prime contractors when he solicits subcontractors.

OPM officials are production and planning engineers on machines not working to full capacity in their territories. They need these facilities records so that they can do their work efficiently. Such listings are kept as voluntary as possible, although factories known to have hard-to-get machines available are solicited for listing in the OPM files.

Once the completed forms are received, they are analyzed by experts and indexed in as many of the 29 classifications, into which Chicago OPM has broken the metal industries, as their equipment permits. A versatile firm may have several classifications, as, for example, a factory with a large foundry for non-ferrous castings and also production tools for machining operations. This type of indexing is known as a Trade Group classification and is a shortcut method of locating potential contractors to do a specific job.

Information about each plant is sum-

FLEXIBLE ABRASIVE WHEELS



Designed for precision work where flexibility is required, these wheels are useful accessories for sanding and finishing regular and irregular jobs, penetrating into difficult recesses, lapping holes in dies, finishing various shapes of metal, wood, rubber and plastic parts.

Useful for finishing propellers in aircraft construction. Descriptive bulletin and sample wheel will be sent on request.

FIELD ABRASIVE SPECIALTY MFG. CO.

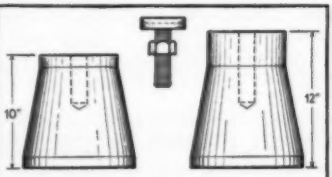
203 LOWE BLDG., DAYTON, OHIO

Ideal FOR LAYING OUT, AND INSPECTING JIGS, FIXTURES, ETC.

48" x 96" ACCURATE PLANE WITHIN .005 INCHES

Every Feature Designed for Convenience!

● Ingeniously constructed for great strength and rigidity without excessive weight. SEVEN support-points—one in the center—for maximum flexibility of use. FIVE blocks or legs are provided, each adjustable to compensate for floor irregularities. Made by Master Toolmakers, to highest machine shop standards, the South Bend Surface Plate is suitable for machine shops, manufacturers, and large tool rooms. Write us for new folder describing the Surface Plate in detail—or ask about your tooling problems in general. South Bend Tool & Die Company, 2509 South Main Street, South Bend, Indiana.



ADJUSTABLE BLOCKS

Available in either 10" or 12" height, these adjustable blocks provide firm bearing support. 6" screw, threaded 1½-12 is topped with a 4" cap, recessed to contain the machined support-pad. Rugged 2-3/16" hexagon nut locks the adjustment.

SOUTH BEND TOOL & DIE CO.

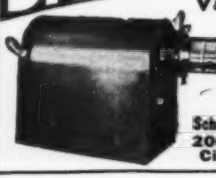
marized and filed under combinations of machines available in the Machine Group cards, the company's name being on as many cards as types of machines are listed for it. Special machines, not common enough to be included in the broad machine groups are listed separately in alphabetical order. Names of the machine and companies possessing such machines are identified in this file.

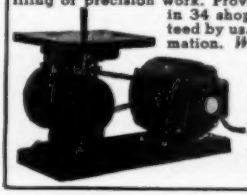
Reference is made to the trade group file if a series of operations is called upon in the contract under consideration, and to the Machine Group or special file for rarer machines if the operations may be performed on single machines. Smaller organizations are usually recommended for smaller contracts, larger plants for larger bids. The scope of the one office may be judged by the fact that prime contractors from as far away as Baltimore and Philadelphia have obtained lists of potential sub-contractors from the Chicago branch of Defense Contract Service.

Often when companies have been found apparently suitable for a specific sub-contract according to OPM's files, representatives of those companies call at the offices, where skilled engineers sit down with them and go over drawings and specifications on difficult jobs. Prime contractors oftentimes supply sub-contractors with raw materials required for the work. This is indicative of the harmony sought between prime and sub-contractors, and often attained. Once the Defense Contract Service of OPM has brought them together, the federal agency discreetly steps out of the picture leaving prime and sub to work out their problems between them. If snags become too difficult, efforts are made by the Federal body to help untangle them, though. Often the prime contractor sends a representative to look over the sub-contractor's plant before the sub-contract is let. He has a lot at stake—too much to risk wildly.

The little fellow with just a few machines often finds it difficult to get work, even with OPM pulling for him. These concerns should do a good selling job by contacting holders of prime contracts and letting them know of services available. Lists of prime contractors may be obtained from financial papers or government report offices.

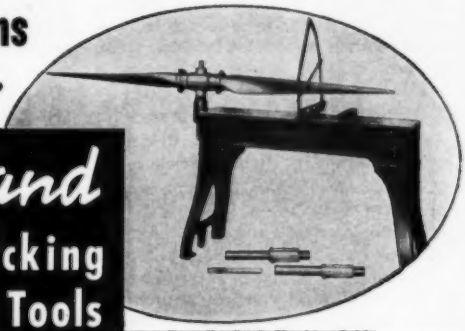
Small plants often do good, conscientious jobs, but they have to prove it. If they succeed they're well rewarded. In some communities that felt they weren't getting enough defense business, small operators got together to see what their combined equipment could do. The balance of the equipment is often amazing. The combined facilities resulting from such pooled resources often qualify for orders that benefit communities. Companies get together on bids, pick a good, intelligent fighter to get the business and get together on the performance bond.

SCHAUER
Speed Lathes
Variable Speed

Ideal for lapping, filing, polishing small metal and plastic parts.
Write for Catalog 400.
Schauer Machine Co.
2064 Reading Rd.
Cincinnati, Ohio

POSTEL FILING MACHINE
Files faster than by hand. Built to do heavy filing or precision work. Proven dependable in 34 shops and guaranteed by us. Get full information. *Write for a bulletin.*

(Agents Wanted)
Postel Filing Machine Co.
915 Washington Ave.
Minneapolis, Minn.

Speed Inspections and Save with—

Sundstrand
Propeller Checking and Balancing Tools



Propeller Pitch Checking Table

For Airport Service and Manufacturing

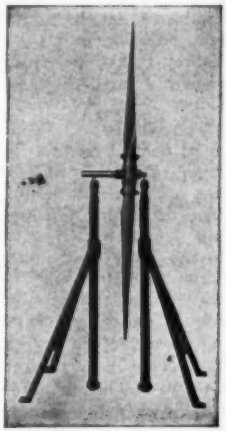
Especially designed to facilitate inspection and adjustment of airplane propellers; Sundstrand Checking and Balancing Tools are reliable time-saving conveniences, highly accurate and durable.

Checking Propeller Pitch — Sundstrand Propeller Pitch Checking Equipment, shown above, comprises a rigid bed with accurate top, mandrel support at one end, and adjustable 0° to 60° protractor. Mandrels are available for all S.A.E. tapers and splines.

Balancing Propellers — The Sundstrand Propeller Balancing Tool, at right, has 11-foot swing. It is ruggedly built with true-running, accurately ground discs in a highly sensitive ball-bearing mounting; ideal for all usual propeller balancing jobs.

General Shop Work — Other handy Sundstrand shop accessories include general-purpose balancing tools in 8 sizes, ranging from Super-sensitive Bench Type to 12-ton capacity; and Precision Bench Centers in 7 sizes from 6"x18" to 12"x60".

Write for Illustrated Bulletin SBT-436 fully describing these high-grade, big-value tools; and ask for name of nearest dealer.



Propeller Balancing Tool

Dealers: Sundstrand Open Line Tools listed above are popular items which offer attractive sales opportunities. Investigate. Details on request.

Sundstrand Machine Tool Co.

2535 Eleventh Street, Rockford, Illinois, U. S. A.

RIGIDMILS • STUB LATHES

Drilling and Centering Machines • Hydraulic Operating Equipment

In one case, 16 different companies got together with one responsible man to handle such contract orders for them, and now they're working hard, as a unit.

OPM officials recommend then that:

1. Factories fill out Form 31-5B or the equivalent in their districts.

2. They check the bulletins on what orders are available and see what they can do to obtain such orders.

3. They study awards of prime contracts with a view to offering their services as sub-contractors to those prime contractors. Major manufacturers are looking upon sub-contracting with ever-increasing favor.

4. They pool resources with other manufacturers whose equipment dovetails with theirs in order to have the combined facilities necessary to obtain valuable sub or prime contracts, if they find their equipment not sufficiently diversified to handle the orders alone.

The Office of Production Management doesn't confine its efforts to linking producers with production. It also has available to manufacturers, literature describing the methods of obtaining defense contracts, such as "Selling to the Navy" and "Army Purchase Information Bulletin." Staff members there can also give advice on whom to see in selling to any major military purchaser, often saving manufacturers' representatives from expensive, impractical trips to Washington.

They're hand-picked, these OPM officials. In the Chicago branch, Coordinator is W. Homer Hartz, chairman of the Illinois Manufacturers' Association and president of Morden Frog & Crossing Works. Thomas S. McEwan, manager, was drawn from McClure, Hadden & Ortman, prominent industrial engineering firm. He's well known for his work in the A. S. M. E. Senior Engineers in the office are C. D. Anderson, until recently tool and methods engineer with Taylor Forge and Pipe Works and formerly as industrial engineer with Stevenson, Jordan & Harrison and other prominent engineering concerns, and Seward M. Roberts, who left plant managership of American Flange Co. a short time ago.

These are the men who handle your problems in the Chicago branch of the Washington-directed Defense Contract Service of the Office of Production Management. It's a federal agency that may or may not prove of invaluable service to you and your industry.

It all depends on you.

Conserving Men, Money, and Materials

In times like these, when industry is confronted with emergency production demands, the need for more effective accident controls in order to conserve men, money, and materials becomes of paramount importance. Plant expansion, development of new processes, maintenance of heavily worked equipment, employment of new workers, and other similar problems call for more than usual ingenuity and skill on the part of management, if a "job" is to be done not only well but safely.

These vital considerations are emphasized in a new report entitled:—"Conserving Men, Money, and Materials in Essential Industries."

The report lays particular stress on proper consideration of accident costs. Of far greater significance than the threat of personal-injury accidents are the enormous potential losses of precious time and the spoilage of equally precious materials that result from mishaps sometimes termed "near accidents"—indirect losses which are generally overlooked in compiling accident reports or statistics, yet which to the production executive represent very real items of industrial waste.

Copies of this report are available to executives who write on their business stationery. Address:—Policyholders Service Bureau, Metropolitan Life Insurance Co., One Madison Ave., New York., N. Y.

FOR INTERNAL THREADING OF THE SMALLER DIAMETERS

MODERN COLLAPSIBLE TAPS

The new MODERN Collapsible Tap can cut threads as small as 13/16" diameter. There is no need anymore to use solid taps for these smaller diameter threads.

What is more, all MODERN Collapsible Taps do close bottom threading with standard chasers. That's because the body of this new tap is made in one piece with solid end and regular chasers extend beyond the face of tap body.

Here is a way to reduce the time for your tapping operations and get clean accurate threads. To find out more about MODERN Collapsible Taps, ask us for a copy of Bulletin M-111.

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Division Consolidated Machine Tool Corporation

ROCHESTER **NEW YORK**

MIDWEST TAPER AND PIN DRIVES

- ABSOLUTE RIGIDITY AND PERFECT ALIGNMENT BETWEEN TOOL AND HOLDER
- EFFECTIVENESS UNIMPAIRED THROUGH LONG USE
- SIMPLE AND APPLICABLE TO A WIDE VARIETY OF TOOLS

MIDWEST HOLDER
(Tool removed)

Illustration above shows Midwest countersink, counterbore, end mill and core drill. The Midwest drive can be applied to these and many other types of tools.

Ask for Catalog 17

The Midwest Drive holders have a stub taper socket with a round pin partly imbedded in the wall; Midwest cutting tools have a corresponding stub taper shank with a groove to fit the pin in the holder. No keys, screws, bolts, or springs are employed—no loose parts easily dislocated or lost.

The Midwest Drive is simple—applicable to a wide variety of tools. Its rigidity and effectiveness are still intact even after long and continuous use. The holder is designed so tools can be interchanged rapidly.

MIDWEST TOOL & MFG. CO.
2360 West Jefferson • Detroit, Mich.

MIDWEST

Precision METAL CUTTING TOOLS

END MILLS • SLEEVES • COUNTERBORES • DRILLS • SPECIAL TOOLS
REAMERS • MILLING CUTTERS • FORM TOOLS • CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

Welding Helps "Tooling-Up"

By ED C. POWERS

MODERN methods of "tooling up" for National Defense production can save 31% over time formerly required, also reduce cost and weight of jigs and fixtures by 32% and 17% respectively according to figures just released by The James F. Lincoln Arc Welding Foundation, Cleveland.

The data upon which these figures are based were submitted in a report by officials of a large company actively engaged in production of mobile field military equipment. The purpose of the report was to show the advantages of modern arc welding in the essential operation of producing jigs, fixtures, etc.

In this particular case, "tooling up" for production required a total of 112 special jigs, dies, fixtures, etc., which were made by arc welding at an actual cost of $8,476.24 and in a total of 3,696 man-hours.

Before adopting modern welding for these tools, a careful estimate was made to show the cost and time required. This estimate included the patterns and their machining, plus the cost of materials. On such a basis, the cost of tools and fixtures by the former method was $12,467.84 and the man-hours 5,264.

Figures giving comparative cost, fabricating time and weight for the new welded construction and the former method, covering eight typical examples of jigs and fixtures in this plant are given in the accompanying tables, also shown in the illustration.

As shown in the table, the eight welded jigs and fixtures were made at cost savings of $318.97 which is only slightly less than the cost for patterns alone for the former method ($403.50). Thus, practically the entire cost of patterns was saved.

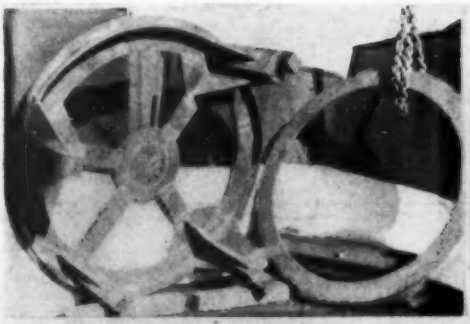
The figures revealed in this report indicate the versatility and usefulness of modern arc welding in the present emergency. It permits getting vital equipment into production at a much faster rate and also saves industrial concerns a high percentage of costs on "tooling up" operations.

Explaining why use of welding saves time, money and weight in "tooling up" operations, the authors of the report state:

"Rolled steel does not have the wide price fluctuations of castings. The more constant material cost of welded design tools and fixtures is desirable.

"Rolled steel is dependable and uniform as to quality. Blow holes and internal strains often are present in castings, and frequently these are not discoverable until part, or all of the manufacture is finished. This hazard may add to the cost of cast tools.

"The uniformity of rolled steel as-



← FIG. 1

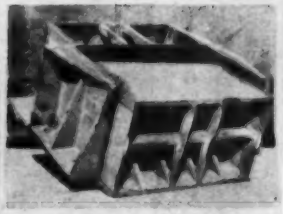


FIG. 2.

← FIG. 3.

FIG. 4.

FIG 5.

FIG. 6.

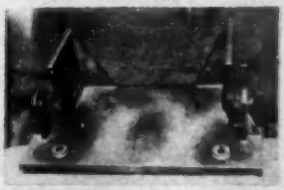


FIG. 7.

FIG. 8.

Fig. 1—Arc welded milling fixture for circular truck part. Fig. 2—Movable and stationary die of arc welded construction. Fig. 3—Arc welded drill jig for front axle. Fig. 4—Die of arc welded construction for front steering rod. Fig. 5—Arc welded boring fixture for front axle. Fig. 6—Axle drilling fixture of all welded construction. Fig. 7—Arc welded drill jig for frame die. Fig. 8—Arc welded drill jig for center plate of truck frame.

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THIS NEW GORTON MUNITIONS ENGRAVER is *simplified* in design for rapid *quantity production* of precision munitions parts.

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SAVINGS IN TIME AND COST ON JIGS AND FIXTURES BY WELDED CONSTRUCTION

Item	ARC WELDED CONSTRUCTION Cost	Time Hrs.	Weight Lbs.	FORMER CONSTRUCTION Cost	Time Hrs.	Weight Lbs.	Pattern Cost
Milling Fixture for Truck (Fig. 1)	$ 92.71	50	1505	$ 171.12	64	1808	$ 73.50
Movable & Stationary Die (Fig. 2)	103.47	36	1634	165.16	57	1980	59.50
Drill Jig for Front Axle (Fig. 3)	73.98	36	792	102.43	43	950	40.50
Die for Front Steering Rod (Fig. 4)	67.66	26	226	92.16	58	273	58.50
Boring Fixture for front Axle (Fig. 5)	163.92	63	2068	227.62	95	2512	74.00
Drilling Fixture for Axle (Fig. 6)	80.25	33	848	90.76	34	1000	32.00
Drill Jig for Frame Tie (Fig. 7)	41.59	25	362	65.12	39	434	32.50
Drill Jig for Center Plate (Fig. 8)	59.38	32	575	87.56	46	690	33.00
TOTALS	$682.96	301	8012	$1001.93	436	9647	$403.50

SAVINGS WITH ARC WELDING

COST	For Former Construction	$1001.93
	For Welded Construction	682.96
	Cost Saved	$ 318.97
	% Savings	32 %
FABRICATING TIME:	For Former Construction	436 Hours
	For Welded Construction	301 Hours
	Time Saved	135 Hours
	% Savings	31 %
WEIGHT:	For Former Construction	9647 Lbs.
	For Welded Construction	8012 Lbs.
	Weight Saved	1635 Lbs.
	% Savings	17 %

sures a dependable safety factor. There is little likelihood of failure in service of a welded design tool.

"The certainty of getting required strength from rolled steel, permits the use of a minimum amount of metal in tools and fixtures of welded design. Cast fixtures require an excess of bulk and weight to insure proper service life.

"Rolled steel is not subject to hidden and unsuspected weaknesses (provided the design and workmanship are adequate) and therefore welded design tools and fixtures may be counted on for a long, dependable service life. Progressive failures in service are rare. Changes in design can easily be made by burning and rewelding.

"Summary: — Welded design gives conspicuous advantages, such as superior physical qualities of steel; simplicity of design; ease and speed of fabrication; superior service life; and savings of cost on material and production."

Discovery of the advantages of arc welding in all fields of metal fabrication and construction is being stimulated by The James F. Lincoln Arc Welding Foundation through its $200,000 Industrial Progress Award Program. 458 individual awards ranging from $100 to $13,700 are established for written reports describing advances and improvements made possible through

WALKER-TURNER BAND SAWS
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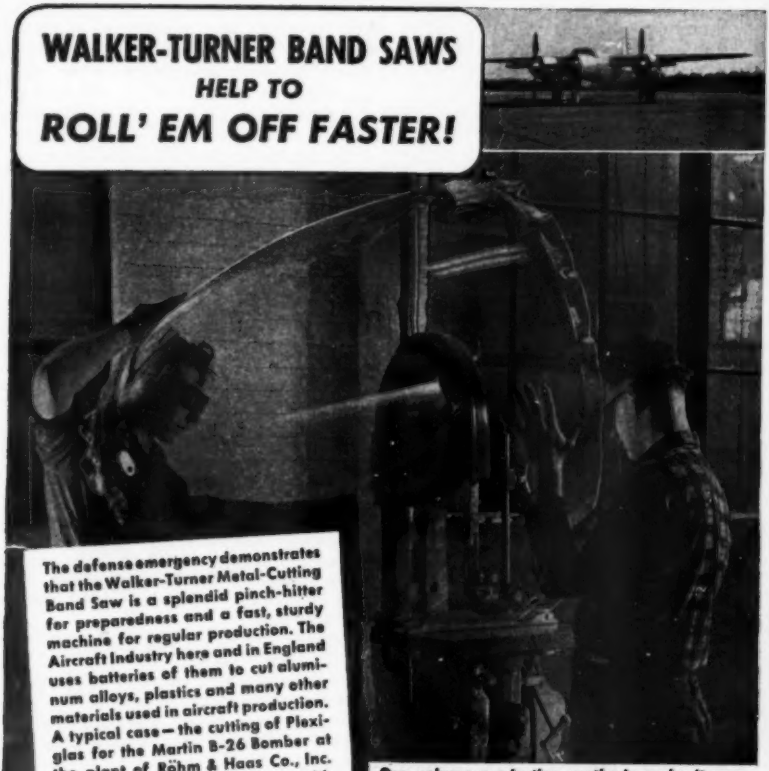

The defense emergency demonstrates that the Walker-Turner Metal-Cutting Band Saw is a splendid pinch-hitter for preparedness and a fast, sturdy machine for regular production. The Aircraft Industry here and in England uses batteries of them to cut aluminum alloys, plastics and many other materials used in aircraft production. A typical case—the cutting of Plexiglas for the Martin B-26 Bomber at the plant of Röhm & Haas Co., Inc. —is shown here. Equipped with back gearing and cone pulleys, Walker-Turner Band Saws have a very wide range of speeds—70 to 5300 s.f.m. in the 16" saw, and 61 to 4630 s.f.m. in the 14" size. This enables them to cut practically all materials, from wood to tool steel.

Our volume production methods make it possible still to offer reasonably prompt shipment.

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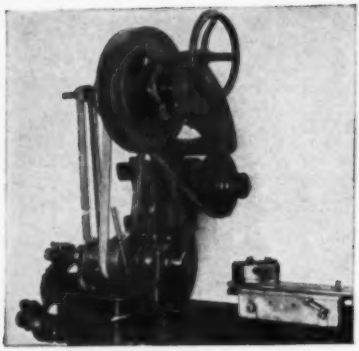
FOR METAL, WOOD AND PLASTICS



No. 1 B & S Wire Feed Screw Machine

INSTANT Change RPM

Machine tool operators who can get **exactly** the right speed **easily** and **instantly** will use that speed and **increase production.** Given Vari-Speed Motor Drives provide infinitely variable speed control without belt shifting or gear changing. Adds 30% to speed range. Change speed while operating. No tool marks. Easily and quickly applicable to old machines. Modernizes for use of carbide tools. Precision built. Dynamically balanced. Sealed ball bearings. Immediate delivery. Sold on approval. Money back in 60 days if not entirely satisfactory. Fully patented.

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GIVEN VARI-SPEED DRIVE

application of the arc welding process. This program was announced early in 1940 and will close June first next year. In the meantime, however, significant data brought out in the studies showing how savings in production time, cost and other benefits are possible, can be applied immediately without in any way affecting the rating of the report for award. Thus, the benefits of the widespread study become immediately available to industry.

Books on Metal-Working

The recent bulletin "Books for the Defense Program" contains five titles of especial interest to machinists and other persons intimately concerned with metal-working.

"Milling Practice" covers the use of the milling machine in engineering production, the universal spiral indexing head, and many other features of milling work. "Lathework" covers engine lathes, turret and automatic lathes with many practical examples. "Drilling and Grinding" covers drills, grinders, and centerless grinders. All of these works were prepared by E. Molloy, as was also a handy volume titled "Sheet-Metal Work."

"Gears and Gear-Cutting," edited by F. J. Camm, covers its subject in a well - organized manner. Principles, practice, and formulas are studied.

All of these books are published by Chemical Publishing Co., 234 King St., Brooklyn, N. Y.

Plastic Gear Materials

Synthane Corp., Oaks, Pa., manufacturers of Synthane Bakelite-laminated have prepared a new folder of their Silent Stabilized Gear Materials.

The folder describes the principal properties of Synthane grades most used for gears, and the uses and advantages of Synthane. For ease and speed in calculating the h.p. transmissible by Synthane gears there are six convenient new charts for gears of 2, 4, 6, 8, 12 and 18 pitch. Each chart shows the per inch of face at various pitch line velocities for gears of 12, 16, 25, 38, 50 and 60 teeth.

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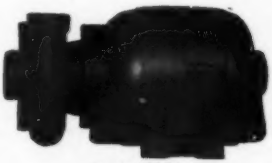
At a time like this only the BEST can be depended on ... and that's FULFLO PRODUCTS



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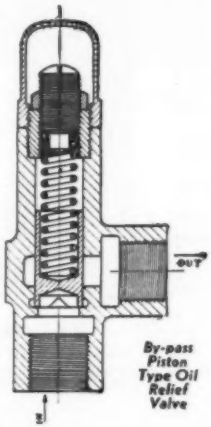
Vertical or horizontal types ... whichever type is most efficient and result-producing is available. Exact position of discharge is assured.



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Cast iron or brass. Brass, hardened steel or stainless steel pistons.

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THE "PRECISION"-THE CENTER OF CENTERS is made for the smallest tool room lathes as well as the largest railroad equipment. Large taper thrust and annular roller bearings precision mounted, assure accuracy and long life under severe conditions. Front bearing cone seats on resilient pad—a shock absorber that protects from tool breakage or spoilage of work. Available in taper shank, slip-in, slip-over and spindle types.

THE UTILITY SLEEVE cuts small tools at least 40% (some users report 75%). This removable taper shank tool driver is used with taps, drills, countersinks, reamers, end mills, center drills, counterbores, woodruff cutters, taper pin reamers, etc. The sleeve is a two jaw collet in action, fitting over the diameter of the shank of tool, which is positively driven by flats or the tang on shank end.

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Utility Tools

Special bulletins give full information on Utility Tools. Check the ones in which you are interested, pin to your letterhead and mail today.

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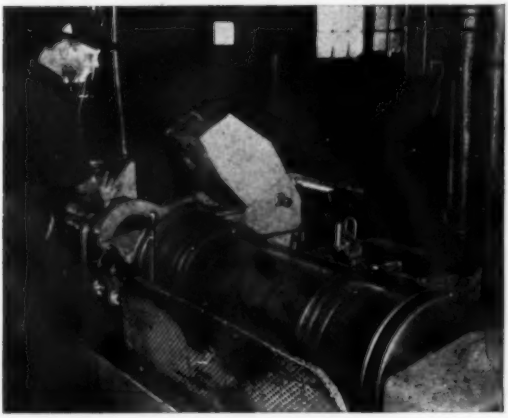


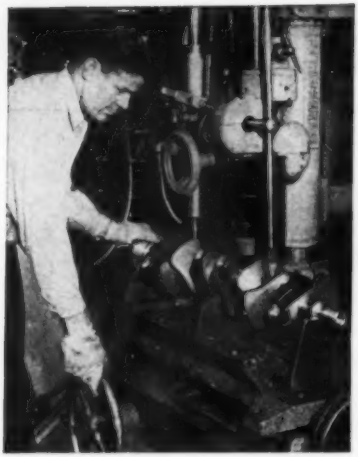
1. Determining the exact mass center of a crankshaft forging before machining by spinning it in the mass centering machine. This permits accurate machining on a crankshaft already in fine balance when machining is finished.

Balancing Automotive Components

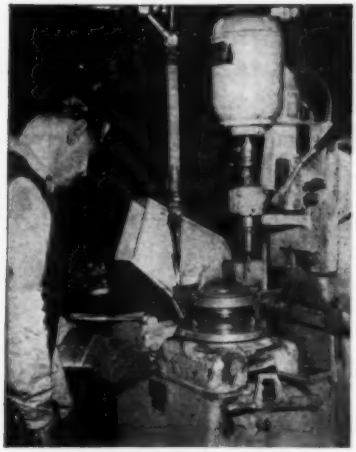
By Carleton Cleveland

VIBRATIONLESS operation is a much sought-for accomplishment in all types of engines, machines, motors, and other pieces of mechanism, to eliminate wear and tear and to make for smooth, even running and the avoidance of what is sometimes referred to as a "rough engine." In the manufacture of automobiles, for instance, the importance of balance in vibrationless operation, not only of the engine, but in the many other vital rotating elements of the present day automobile, is emphasized in a new phase of the manufacturing program being carried out at the Flint, Michigan, plant of the Buick Motor Division.

2. After a crankshaft is machined and ready for assembly it is placed in a balancing apparatus and spun. Any out-of-balance is registered electrically by a light beam on the frosted glass at left. The location and amount of out-of-balance is automatically determined and the necessary stock removed to bring the crankshaft to within ¾-ounce-inch of perfect balance.



3. When the amount and location of balance error has been determined on the balancing machine, drillings are made to remove sufficient metal to bring the piece within the balance limits.

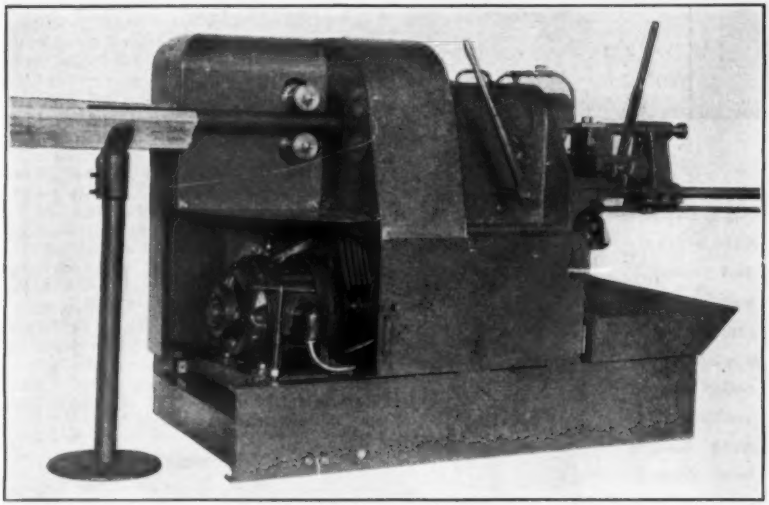


4. The Harmonic Balancer, which is mounted at the front of the crankshaft to eliminate whip or vibration, is brought to within ¼-ounce-inch of balance perfection before being assembled to the shaft.

Throughout the years of motor car development, reduction of vibration has always been a problem to which much specific attention has been given in order to meet the demands for smoothness in operation, minimizing of noise, and the reduction of wear on moving parts. Development of the high compression, high power, high performance automobile engine of today has stepped up road speed and made increasingly important the matter of fine balance

5. The complete engine assembly is balanced in a special machine. Connected by a special chuck, the engine is revolved at critical speeds, the vibration being measured by electric gages.

THE MODERN CUTTING-OFF MACHINE



1000 PIECES PER HOUR—

—of 9/16" O.D. tube, with 1/8" wall, cut into 18" lengths. For this type of work the hand operated machine is faster than an automatic.

The Modern Cutting-off Machine is of rugged construction, engineered for heavy duty service and long life. Anti-friction bearings insure low maintenance and operating costs.

Three models are available, handling stock up to 4 5/8" O.D.

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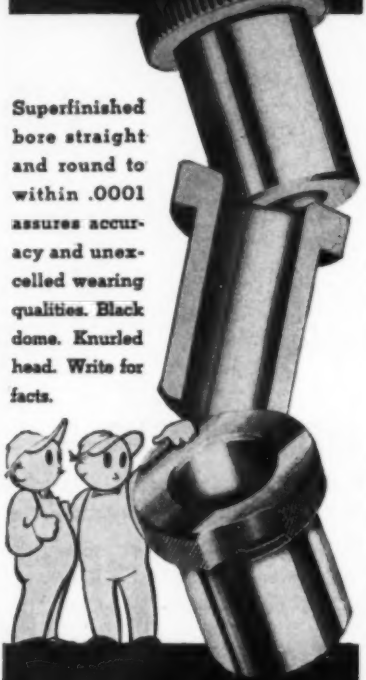
Superfinished bore straight and round to within .0001 assures accuracy and unexcelled wearing qualities. Black dome. Knurled head. Write for facts.



UNIVERSAL
Engineering Company
Frankenmuth, Mich.

in all engine parts, as well as the various chassis units, etc.

The extent to which dynamic balancing has advanced in the Buick engine plant is indicated by some 10 separate and distinct balancing operations covering vital engine parts, such as the harmonic balance assembly; clutch driven plate assembly; fly-wheel; crankshaft; and finally the completed engine. Special types of balancing machines are used to calibrate connecting rods; the rods being checked on the balancing machine, with the indicators set to proper limits and milling cutters automatically advancing to remove sufficient stock, if necessary, so that when the rods are placed on the knife edges of the checking scale, the limit of ⅛ ounce on either end will not be exceeded.

Pistons are measured, weighed, and fitted in the same manner, the work being carried on in a controlled-temperature room. Extension of complete balancing operations to other parts of the chassis includes the balancing of third member assemblies—drive shaft, torque tube, flanges and bearings—and rear axle sub-assemblies.

Pattern Maintenance

By M. G. Heuer

Many foundries are modern in every detail but one—which is, that they do not provide facilities to keep their pattern and core box equipment in condition to give customers the quality castings they have a right to expect from a foundry that has every appearance of being able to produce quality work.

One of our supply sources for motor block cylinder heads and transmission castings is ultra-modern in every detail in its foundry and core room. But for years this plant had depended on jobbing pattern shops to do repairs and small alterations on pattern equipment. This made it rather difficult to keep jobs that called for a set schedule of daily deliveries, because it was impossible to keep the equipment in the required condition.

Six months ago, through the advice of a trouble shooter who called on the trade on complaints of faulty cast-

No special skill needed to do fast, accurate tapping on this

Ettco-Emrick FOOT-OPERATED TAPPING MACHINE

THIS feature—always one of the Ettco-Emrick Tapping Machine's biggest advantages—is a life-saver in the face of today's shortage of skilled labor.

And the reason no special skill or educated touch is required is that Ettco-Emrick design **eliminates the human element from the actual tapping operation.** An exceptionally sensitive friction-clutch drive combined with an accurately balanced foot-operated gravity feed does the job. The operator's part is confined to feeding the work—for which both hands are free—and pressing the foot pedal—which requires so little effort he can do it all day without tiring.

2400 tapped holes per hour is a production readily maintained on the Ettco-Emrick with the standard 2-spindle head as illustrated. And with interchangeable Ettco-Emrick Multiple-Heads, available with spindles up to 12, production can be stepped up to 12,000 holes per hour.

IMPORTANT

The right taps and the right work holding set-up are essential for high tapping production. Our recommendations, based on 25 years specialization on machine tapping, are yours without obligation.

SEND FOR THESE BULLETINS

Bulletin No. 4—gives the complete story about the Ettco-Emrick Tapping Machine. **Bulletin No. 3** gives details about the Ettco-Emrick Multiple Heads, made up from stock parts to fit your requirements. *Write for your copies today.*

ETTCO TOOL CO.

596 Johnson Ave., Brooklyn, N. Y.

DETROIT CHICAGO

The Famous Ettco-Emrick

DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship

Kipp Air Grinder
SPEED UP TOOL ROOM PRODUCTION
Kipp Air Tools give you highest speeds, lowest prices and have proved indispensable in thousands of tool rooms and production departments. Free trial permits any concern with a satisfactory credit rating to try any Kipp Air Tool for ten days. Grinders sell from $9.75 to $58.75. Chippers and Filers at $19.75. The BB Grinder illustrated is only..... $25
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ings, this concern awakened to the need for equipping a small space in the pattern storage room with light, modern machines, including a jointer, a tip saw, a drill press, and a band saw. The investment was small, but the new equipment made it possible for anything that needed attention to be carted directly to this department and fixed without loss of time.

This foundry is also finding that it can save considerable time and expense by taking on these jobs at opportune moments, without putting on any additional help, or tying up the company truck for delivery to the job shop. Men who are doing ordinary repair jobs take on this extra work when they have time, and are able to do accurate work under the supervision of the men who did the original job.

These repair machines have been installed in a storage room where core boxes were formerly stored and the new department is proving very profitable.

Don't Call 'Em "Belt Hooks"

By W. F. Schaphorst, M. E.

Are all metallic belt fasteners "Belt Hooks"? They are not!

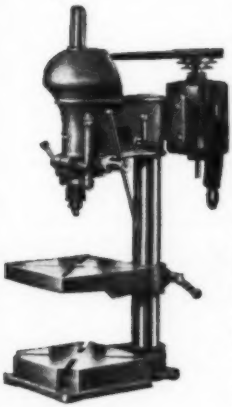
I have never been able to understand why so many belt users and even belt experts persist in erroneously applying the name "belt hook" to such belt fasteners as are now commonly used, simply because those fasteners are made of metal.

"Belt hooks" are used for fastening round leather belting only, and for nothing else. They are shaped much like a tall letter "C" the curved ends preventing the round belt from slipping out after it is in position.

It is true that some of the manufacturers of metallic fasteners themselves call them, "belt hooks," but they shouldn't. The "C" type of hook is the only real belt hook in leather-beltdom. The belt hook was in existence before other types of modern metallic fasteners came into use and for that reason, no doubt, the term is misapplied to all belt fasteners made of metal.

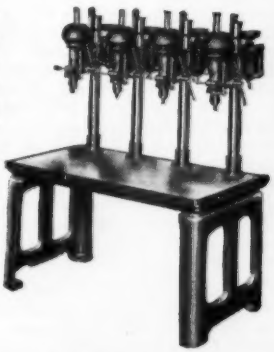
Call them "belt fasteners."

Any Way you Figure it
DURO DRILL PRESSES ARE MONEY MAKERS



In all types of plants, Duro Drill Presses are increasing production. American and foreign industry has adopted them because; their long life and superb performance, through highest quality materials, precision construction, make them dependable money makers.

A six spline spindle supported by New Departure Ball Bearings, durability, flexibility, versatility, and accuracy—make Duro Presses money and time savers in any shop.



Slow and high speed presses, in floor and bench models, in single and multiple spindles, cover most all drilling requirements.

Ask for Complete Details

Write DEPT. BB-20.

Use Duro Drill Presses in your plant. You'll be money ahead.

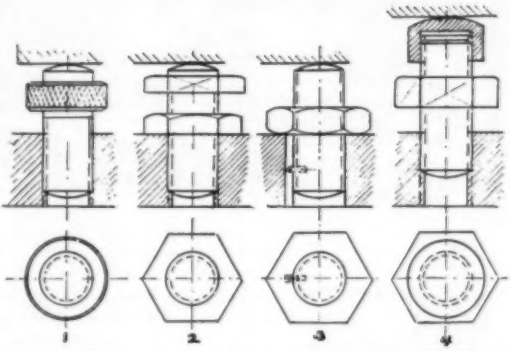
DURO METAL PRODUCTS CO.
2649 N. KILDARE AVE. CHICAGO, ILL.

Screw operated height adjustable Dogs

By Paul Grodzinski, England

Height - adjustable abutments in fixtures are necessary in places where the workpiece would become dislocated or subjected to deformations during machining operations. There exist a great variety of height - adjustable dogs for fixtures, some using wedges, springs etc., to give workpieces the necessary support. Troubles with these devices are avoided if screws are applied, which need, however, some distance between fixture body and workpiece to be operated. The simplest form of such dog is a type of head screw, the nut or female thread being provided in the fixture body (Fig. 1). Such a screw is likely to become loose, in particular in the case of milling operations. Therefore, a counternut should be applied in connection with the screw, shown in Fig. 2. Obviously in such a case for the setting of the dog two operations are necessary, i.e., adjusting in height and locking; for loosening, the same operations have to be carried out in reverse order. To utilize the same spanner, the same width across flats has to be applied for the head, and for the counter nut.

The disadvantage of the described designs is that always a distinct rubbing movement is exerted against the lower side of the work-piece. In the case of sensitive work-pieces therfore, objections may be raised against the application of this principle. Further, as the friction between head of the dog and the workpiece varies, the operator does not know the exact amount of clamping pressure to apply. Fig. 3 shows an improved form in which the head only performs a straight movement with regard to the workpiece. This movement is obtained by a small vertical groove in which a pin, fixed in the screw shank, is guided. There exist also other possibilities, for instance to fix a transverse or Woodruff-key pin in the fixture body and to provide a longitudinal slot in the screw. This design has some obvious advantages, as only a drilled hole has to be provided in the fixture body. Further, the screw is very simple, consisting only of a threaded shank. On the other hand the cost of this design is increased by the slot and pin.



In the design suggested in Fig. 4, a double screw is applied, giving a quick adjustment and avoiding also the rubbing against the workpiece through use of a special cap nut. The friction between the surface of the cap and the workpiece hinders any rotating movement of the former. One screwed end may be provided with left hand thread; the other with right hand thread, thus giving a quick approach to and withdrawal from the workpiece. If two right-handed screw threads are applied, however, with a small difference in pitches, the approaching movement is slowed down, since for one rotation of the screw the cap is only moved in the proportion of the difference in pitches. On the other hand a higher pressure may be exerted.

The devices described can also be used as main clamping devices in fixtures, when the space is very limited.

DANLY KWIK-KLAMPS

TOGGLE CLAMPS FOR QUICK, POSITIVE CLAMPING IN ANY POSITION WITH

STANDARD HALF TURN

OR STRAIGHT CLAMPING BAR

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DANLY DIE SETS and DIE MAKERS' SUPPLIES

Cleaning Holes at Drilling

By Frank V. Faulhaber

In various operations, it is frequently necessary to clean the work of metal chips, bits, filings and dust. Sometimes a cloth is used, sometimes the hands, oftentimes the machinist just blows away as much as he can of these metal leavings, which frequently scatter into other parts of machinery. In many cases, the field of work cannot be cleaned easily or properly. Notably so is this true of drilling operations, where it is frequently necessary for the operator to remove metal bits from a hole for measuring, or to determine the progress of the operation.

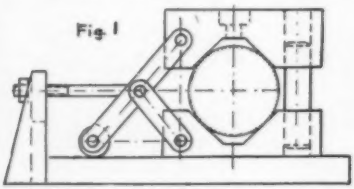
A part may have to be fitted into the hole. The usual and handiest practice seems to be to blow into the hole. It is a question, however, just how much of the dust and chips are blown out. Neither procedure nor result is wholly satisfactory. Moreover, it is a constant inconvenience and hazard by reason of the dust and metal bits blowing into the operator's eyes.

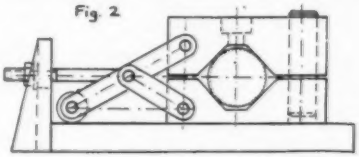
An ever-convenient aid and eye-saver may be had by preparing a piece of steel, highly magnetized, somewhat smaller in size than the holes being drilled. The operator need simply insert this handy instrument into the hole, to free it of unwanted metallic waste. The job is sure, complete, and neat, and the worker can readily remove the bits adhering to the magnetized steel. And he can proceed on his work without an ever-present eye hazard.

Universal Jig for Collars and Round Bars

By Paul Grodzinski, England

A drill jig which does not require special adjustment of the clamping device when drilling bars of different diameters or allowances is shown in Figs. 1 and 2. The shaft, as usual, is guided in a prismatic block with a vee. The slip bushing is provided with a vee on the lower side. Both plates are connected by one or two vertically arranged cylindrical stems. The clamping is effected by toggle levers and a screwed shaft, the nut abutting on a





vertical pillar with a slot. The upper toggle has an extension of the same length as the lever supporting a roller and abutting on the base plate of the jig. For lighter work where no great degree of accuracy may be demanded, the stems can be omitted and the two plates may be connected by another pair of toggle levers, similar to those on the left hand side. Also in this case there is no danger of backlash in the links as the two vees and the enclosed cylindrical body exert a centering action.

"The Merry-go-round Broke Down"

Bull gears on merry-go-rounds are subjected to extremely hard wear for many hours every day. When the Coast Show's merry-go-round broke down in Kirkland, Wash., it was discovered that three broken teeth on the bull gears were the source of the trouble. A

local job welder was called to the show grounds and within two hours' time,

Cut Metals with a *Circular Saw*

Many plants find Delta Tilting Arbor Saw ideal for Metal-Cutting

The photograph above shows how the Consolidated Aircraft Corporation uses a battery of Delta Circular Saws in its sheet cutting department. These low cost high quality saws are employed here to cut aluminum alloy sheets and shapes into the many different forms required in the manufacture of Consolidated flying boats and patrol bombers.

The Delta Tilting Arbor Saw has many fine features that insure long dependable service. These include: Efficient "texrope" drive that eliminates gears; "sealed-for-life" bearings that reduce maintenance and wear; precision raising, lowering, tilting and mitering adjustments of the extra long table that make possible accurate results in handling large sheets.

Other Low-Cost High Quality DELTA MACHINES

The Delta line includes cut-off machines for cutting solid, extruded and tubular sections with polished smoothness, metal-cutting band saws; standard grinders with special features; carbide tool grinders; abrasive finishing machines and a complete line of drill presses.

SEND FOR CATALOG

giving complete details on Delta Tilting Arbor Saw as well as description and prices on the complete line of Delta machines.

DELTA
MILWAUKEE

The Delta Manufacturing Company (Industrial Division)
603-K E. Vienna Ave., Milwaukee, Wis.

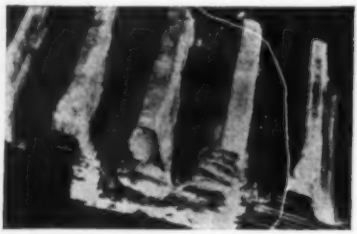
Please send me the new Delta Catalog giving complete details on the Delta Tilting Arbor Saw—also description and prices on the complete line of Delta machines.

Name .....

Address .....

the merry-go-round was spinning its merry way again.

The job which did not even require preheating was accomplished as follows:—the three broken teeth were chiseled off flat. Then the teeth were drilled and tapped for studs which form the base or core of the new tooth. These drilled holes should be spaced so that the distance between studs is 3/16" to 3/8" and they should be drilled to a depth of about 1½ times the stud diameter. Care should be taken to see that the stud "jams" tightly against the bottom of the hole. Cap screws are used for the studs which are sawed off when they are all tight. The studs were dressed down with a grinder until they are smaller than the size of the finished tooth.



Carbon blocks were set up and the bronze deposited at a high heat with a Hobart welder so that it welds to the base of the studs and flows out flat. Care must be taken not to melt the studs where the mixed metal will need dressing as it will be too hard to file. When the job is performed carefully little filing is required to shape finish the rebuilt teeth. The illustrations show 2 teeth finished and the 3d being rebuilt—and the 2 teeth after 4 years use. (Photos courtesy Hobart Brothers Co., Troy, O.)

Preventing Boring Machine Accidents

By Ernest W. Fair

Reduced accidents on vertical boring machines mean less spoilage of work, longer life for machines, lower machine maintenance costs and less personal injury to operators. All of these desirable factors merit continuous consideration of accident prevention by vertical boring machine operators. Here are a number of pointers gathered from veteran machine operators:

1—Never overload; while it is always advisable to take as heavy cuts and feeds as possible, the limit of capacity of the individual machine should never be exceeded. One must be constantly on the alert for signs of overloading and correct such a condition at once.

2—An inexperienced operator never should be placed on a vertical boring machine; the operator should always thoroughly understand the mechanism and its operation. Make sure that everything is clear before moving any of the levers on the machine.

3—Do not move the heads or rams by means of the quick traverse when they are clamped in place. On machines using a toothed clutch, this generally will mean breakage if thrown in while the clamping bolts are tight.

4—Never run the rams too far up or down. The operator should always keep inside the limit marks on the ram. The most common occurrence is allowing the ram to run too low, causing the collar on the upper end of the elevating screw to jam and breakage then ensues.

5—Never run the head too far in either direction on the rail. If run to the extreme end, this means the nut through which the feed screw works, will jam against the collar at the end of the feed screw and break.

6—Never set a tool to rough work before the high spot has been found.

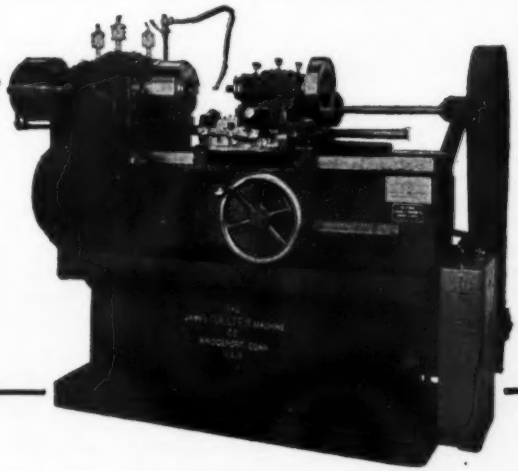
7—Clamp the tool securely in the tool holder every time. Go over the clamping screws each time before a cut is started.

8—Never throw the wrong feed. The only reason for such a happening is carelessness; but it does occasionally occur.

9—Never change the speed of the machine while it is running. This is an easy way to wreck the driving mechanism on a machine.

10—Watch yourself! Only one thing causes personal injury on a vertical boring machine — carelessness — guard against it!

Keep Ahead of DEFENSE DEMANDS *on the PRODUCTION of* EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

The James **COULTER** *Machine Co.*

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CASH IN ON YOUR CHIPS

When the chips from your cutting - off operations come off unbroken, you know they are not binding the side of the cut, generating excessive heat, dulling and breaking blades unduly and slowing down production.

The chips cut by Luers patented cutting-off blades are curved as they leave the stock. The chips thus curved become narrower than the cut itself, freeing the chip and allowing adequate expansion.

Other frictional losses are eliminated because the blade, tapered throughout its entire length provides adequate back clearance, while the T-shaped section develops less friction on the sides of the cut.

Holders are available for all makes and models of automatic and hand screw machines.

Luers blades require sharpening on the face only. In their holders they have all the rigidity of a forged tool. They can be removed, sharpened, replaced and realigned with the work in a fraction of the time usually required.

In writing, tell us the make and model of your equipment. Full information will be sent you promptly.

Produced under license issued by John Milton Luers Patents, Inc.

EMPIRE TOOL CO. 8790 GRINNELL AVE. DETROIT, MICHIGAN

STURDY BUILT

for Long, Hard Service

BALDOR builds a complete line of Bench and Pedestal type grinders — 6" to 12" wheels. (At left, is special Carbide Tool Grinder, 6" wheels, complete for $84.00).

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4368 Duncan Ave., St. Louis, Mo.

BALDOR
BALL BEARING **GRINDERS**

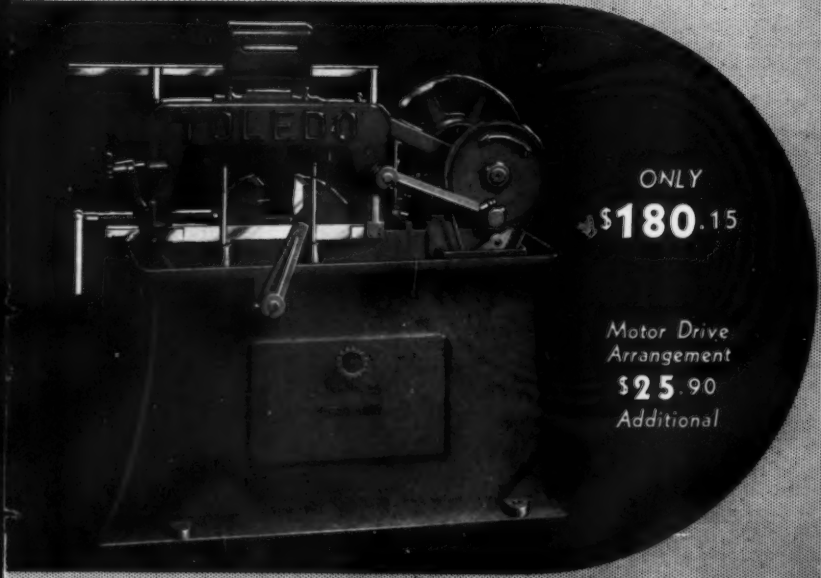
L-W HIGH SPEED POWER HACK SAWS

Quality at Low Cost

IMPROVED DESIGN — HEAVY DUTY — FAST CUTTING. A REAL SAW THAT WILL SAVE YOU TIME AND MONEY.

To start cut, relieve weight of saw frame, hold down on release lever and lower saw to work — start machine. Automatic trip stops the machine on completion of cut. Automatic relief of saw blade on the non-cutting stroke is also provided.

Capacity 6"x6" with 10" to 14" blades — Clutch Pulley 12"x3" — Speed of Pulley 120 r. p. m.



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Here's the ace of portable tools—years ahead in performance. Cuts cost corners in a dozen different ways in modern manufacturing plants and repair shops. Indispensable in the tool room. Unsurpassed on mold and die work. Grinds and polishes rough edges off "border-line" manufactured goods, so it will pass even the most rigid inspection. A real aid in repairing machinery or parts on hard-to-handle, heavy equipment.

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Made of the marvelous new V/T Super Bond that is causing a sensation wherever tried. Chicago Mounted Wheels actually give 150% to 300% longer life, hold their shape and grind more pieces per wheel faster and without sacrifice to cutting action.

Sample Wheel Free—Tell us kind of job, equipment you use and size wheel you'd like to make a test with.

FREE— MOUNTED WHEEL CHART

Heavy wall chart 22x15" shows actual size and shape of every standard Chicago Mounted Wheel.

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FOR PRECISION WORK

Here's the biggest little handful of smooth, controlled power you have ever seen. Carry it to any part of your plant and plug in any electric outlet. Smooths off rough edges on dies and molds, cleans delicate mechanisms, grinds, drills, polishes, cuts, routs, carves, sands, saws, sharpens, engraves, cleans, etc. Uses 300 accessories, quickly changed in easy working chuck. Weighs 12 oz., 25,000 r.p.m. Immediate shipment—Postpaid, with 7 accessories,

$18.50

The HANDEE HI-POWER GRINDER is a constant service tool that gives smooth, vibrationless performance. Fits the hands comfortably. Easy and convenient to use. Operates at any angle. Wide range of Mounted Wheels available to do hundreds of difficult grinding jobs faster and better.

GRINDS · BUFFS · POLISHES

For its weight and type, the HI-POWER delivers greater efficiency at lower cost than any tool of its type. Weight, only 3 pounds, with ample power to drive a 2½" diameter wheel. Speed 17,000 r.p.m. Overall length, including chuck, 10". Accurate, interchangeable spring collet chuck with 3 collets, capacity ¼", ⅛" and 3/32". Housing is strong, cast aluminum, with rubber cushion insulation.

In wood case with 3 Chicago Mounted Wheels, Drum Sander and Bands, Wrenches, Dressing Stone, **$35.00**

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Send today for a Handee Hi-Power. Try it in your own plant for 10 days, and if not satisfied, return it for credit.

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Brackets to fit all machines up to 10 HP carried in stock, *also Special Units for Brown & Sharpe Automatics.*

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MACHINE TOOL Blue Book QUIZ

Just how much do you know about the machine tool industry? Here's your chance to prove it by answering all 25 of these Quiz Questions correctly; 20 correct answers is Good and anything down to 15 correct answers is Fair. Figure your percentage on a basis of 4 points for each correct answer. The answers are given on pages 264. You'll find all of these answers in Blue Book ads.

1—Where is the Fray Machine Tool Company located?

2—What products are made by the Norton Company?

3—Who makes Thor portable tools?

4—Who are "The Tool Holder People?"

5—The William Sellers & Co., organization was founded in 1828, 1938, 1848 or 1858—which?

6—Is Hobart Brothers Company located at Camden, N. J., Troy, Ohio or East St. Louis, Ill., and what do they make?

7—Who are "The Hack Saw People?"

8—What New England firm makes Turret Lathes and Optical Comparators?

9—Who features both air and high cycle portable tools?

10—What Company uses the slogan—"Performance has established leadership?

11—Approximately how many copies of the MACHINE TOOL BLUE BOOK are printed each issue?

12—Who has been featuring "Alter Ego" in connection with what equipment?

13—The 1-¼" to .010" size designation is featured in connection with what equipment, and by whom?

14—'Air Control" is featured in connection with what particular equipment?

15—What means of noise and vibration absorption permits machines to be installed without bolting to the floor?

16—What firm manufactures over 200 gasoline engine, air and electrically operated tools and attachments?

17—What firm advertises that their lathes "Cover the Turning Field?"

18—How many plants does Joseph T. Ryerson & Son operate?

19—Who makes "Milwaukee" milling machines?

20—On what equipment will you find "Micro-Speed-Drives?"

21—What modern method is used to harden gear teeth without altering the shafts?

22—What product bears the same name as a well-known line of fine watches?

23—What new method permits threading four pieces at a time from bar stock?

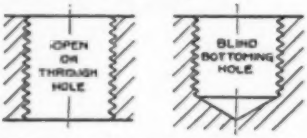
24—How long has South Bend Lathe Company been making lathes?

25—Who advertises "2 Presses in 1 at No Extra Cost?"

Hole Hints FOR TAPPERS

Slow production, rejected parts and broken taps, are often due to poor preparation of holes for tapping operations. Here are some points which will help you to prevent costly losses.

Always keep in mind that good clean drilling and a reasonable size maintenance are keys to better, faster tapping and with less strain on the tap and less power consumption.



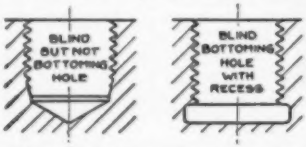
For open or "through" holes in steel, use "*Gun*" or Plug Taps; stick to Plug Taps for gray cast iron and non-malleables; for cast iron containing steel, use "*Gun*" Taps. For blind or bottoming holes, use a Bottoming Tap if the full length of the hole is to be threaded. Always be sure the drill chips are removed from the bottom of the blind hole before you start to tap.

A 100% thread depth requires 3 times the power necessary to tap a 75% thread, but is only 5% stronger. A nut with 50% thread depth will break its bolt before the thread will strip. Good manufacturing practice should provide a depth of thread not less than 62% to 75% (depending on the size) and not more than 83⅓% of the basic thread depth. Remember these facts and you will not make your drilled holes too small.

The tougher and harder the material, or the deeper the tapped hole, the smaller the thread depth you can safely adopt.

Punched holes in thin sheet metal tend to cause taps to "load" and break. See that punched holes are not too small. Same with cored or forged holes in casting or forging. It pays to drill them.

As a guide to the most practicable drill size for all threads, consult any standard tap drill chart. We will gladly send you one on request.



This is one of a series of advertisements published by Greenfield Tap & Die Corporation to help users get greater production from their small tools in these critical times, through making useful facts more widely known

GREENFIELD TAP AND DIE CORPORATION • GREENFIELD, MASSACHUSETTS

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GTD GREENFIELD

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What's New in the Industry

14", 16" and 18" Hydraulic Universal Grinding Machines

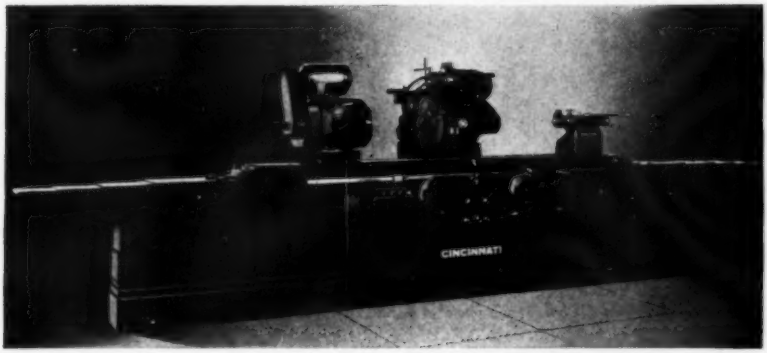
A NEW line of universal grinding machines, built in 14", 16", and 18" swings, and 36", 48" and 72" between-center lengths for each swing, has recently been announced by Cincinnati Grinders Inc., Cincinnati, Ohio.

Table is powered hydraulically, having infinitely variable traverse rates of 3" to 220" per minute. Power table stroke may be set as short as 3/32", simulating the action obtained from a reciprocating grinding wheel spindle. Accuracy of automatic reversal is within .004", allowing operator to power grind exceptionally close to shoulders. Hand table traverse has two speeds (mechanically controlled) — 1/10" per turn of handwheel for close adjustment and grinding shoulders; 15/16" per turn for setting up. Hand servo power control is available as an extra.

for variations in load produced by the variety of grinding cuts encountered with universal machines. Incidentally, bearing diameters of spindle are superfinished to less than one micro-inch. A plain bronze thrust bearing, self-adjusting for wear, is located midway between ends of spindle. Oil under a definite pressure completely fills bearing compartment. The spindle can not rotate until this pressure is attained, and conversely, spindle drive motor automatically stops if oil supply should fail or diminish.

The wheel head may be swiveled 90° right and left. Mounted directly on top of wheel head unit, a 5 h. p. motor drives grinding wheel spindle through V-belts.

A hinge-type bracket at front of wheel head contains the internal grind-



Filmatic bearings are used for main grinding wheel spindle. Each bearing consists of five heavy steel shoes with bronze lining next to spindle. These shoes are constructed to create wedge shaped oil films, and are self-adjusting

ing quill and spindle. This construction saves much set-up time. External and internal work can sometimes be ground in one setting for perfect concentricity. Attachment is always in place, yet completely out of the way.

It may be set up by swinging down and tightening only one bolt.

Headstock incorporates a new type of drive known as the "Speed Ranger." Turning a handwheel at front, an infinite number of speeds may be selected, ranging from 25 to 225 r.p.m. If desired, an optional range of 40 to 360 r.p.m. may be obtained. Graduations on base are for a swivel range of 90° forward and 30° to rear. The unit incorporates a quick-change device for live or dead spindle operation.

Like the hand table traverse, hand cross traverse has a two-speed arrangement; .050" per turn of handwheel in low gear and .250 per turn in high gear. Graduations on rim behind handwheel (see illustration) are a convenient innovation in grinding machine controls, especially for repetitive multiple diameter work. Diameter reduction as small as .0001" may be obtained by hand adjustment. Automatic pick feed may be set for one to seven notches on cross feed handwheel, reducing work diameter .0004" to .014".

Grinding the bore in a large sleeve gear. Several sizes of quills, spindles, and wheels may be obtained for the internal attachment.

Cross feed handwheel and pick feed mechanism — graduations facilitate hand adjustments.

Lubrication is principally automatic. Table ways are protected with telescopic guards, and are pressure lubricated with filtered oil from an individual reservoir. Grinding wheel spindle bearings are also lubricated with filtered oil from an individual reservoir. The same can be said of the hydraulic system, while headstock unit has automatic splash lubrication.

All controls, including electrical push buttons, are closely grouped. Work rotation and coolant flow automatically start and stop with table traverse start-stop lever. Independent controls are also provided for incidental work which does not require coolant, such as truing a part held in chuck.

Net weights vary from 7,600 pounds for the 14" x 36" machine to 10,000 pounds for the 18" x 72" machine, including motors and controls.

A 16-page illustrated catalog, No. G-474 is available.

ALLENS

SEASONED "SHOCK TROOPS"

31 YEARS IN THE SERVICE

PRESSUR-FORMD A CAP SCREWS

IN shock-resisting machine assemblies, "*ALLENS*" have held the front since 1910. And the sharp increase in disruptive stresses — the *new* attacks of emergency strains—are well within the Allen factor of safety.

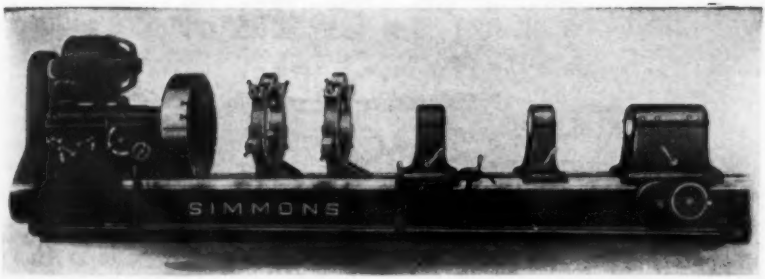
Strength of the product reflects itself in strength of demand for the *genuine.* The largest production-capacity in the industry is giving all it has to meet this demand — *more than two million* precision hollow screws each week.

Every one of these Allen screws goes out as a tested unit of HOLDING-POWER . . . Laboratory tested, *above* specifications, pledged to defend the reputation of your product in *extra*-duty assignments.

Your local Allen Distributor will accommodate you to the best of his capacity and available supplies.

THE ALLEN MANUFACTURING COMPANY
HARTFORD, CONNECTICUT, U.S.A.

Simmons 54" Heavy Duty Boring Lathe



The bed is of a massive design, with thick, double width walls running full length, tied together with double walled cross girts of oval construction.

Headstock is of a simplified design to provide the required range and number of spindle speeds with minimum wearing parts. It is fully enclosed and all bearings and gears are constantly lubricated from positive pressure oil pump delivering filtered oil. Spindle bearings are extra long and large in diameter providing a maximum area of bearing surface to compensate for heavy loads. Either six or four speed changes are provided to the internal face plate through sliding spur tooth gears and one heavy jaw clutch. The face plate ring gear is of steel with an outside diameter equal to that of the face plate to which it is bolted. A direct reading chart

No Dust Problem here!

The use of water on grinding wheels takes care of dust at its source.

Use WET GRINDERS

Sizes: 2, 3 and 5 H.P. for 12" to 18" wheels.

Motor driven coolant pump.

Grinder motor and pump motor operate simultaneously.

Also Combination Wet and Dry Grinders.

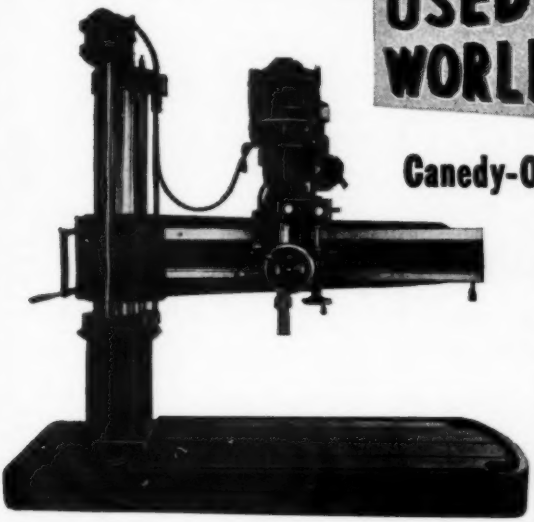
Write for details today.

If your present grinders offer a dust hazard to Health and Equipment, one of the three sizes of STANDARD Exhauster Equipment will rid you of this grief.

Do you have your copy of NEW Catalog No. 43?

THE STANDARD ELECTRICAL TOOL CO.

1954 W. 8th St., Cincinnati, Ohio



USED THE WORLD OVER

Canedy-Otto Radial Drill

Canedy-Otto has been the manufacturer of first-class, high-grade drilling units since 1892. These units are available in single spindle, multiple spindle and radial.

We can help you solve your drilling problems. Send for information on our complete line

Early delivery possible.

SPECIFICATIONS:

	9" Column 3' Arm	11" Column 4' Arm	11" Column 5' Arm
Drills to the center of circle on base or table	73½"	96"	120"
Length of arm	3"	4"	5"
Greatest distance from spindle to base	43½"	43"	48"
Minimum distance from spindle to base	8½"	15"	17"
Minimum distance from spindle to column	10½"	10"	10"
Traverse of spindle	9½"	9½"	9½"
Hole in spindle—Morse Taper	No. 4	No. 4	No. 4
Diameter of spindle at nose	2½"	2½"	2½"
Traverse of head on arm	25½"	36½"	48½"
Traverse of arm on column	21½"	24"	22"
Spindle speeds with 1200 RPM motor	(60, 85, 130, 180, (425, 560, 860, (1200 RPM		on all models
Spindle speeds with 1800 RPM motor	(85, 130, 180, 274, (560, 860, 1180, (1750 RPM		on all models
Feeds per revolution of spindle	(.004" .007" (.010" .020"		on all models
Bearing of arm on column	14"	16"	18"
Size of main driving motor	2 HP.	2 HP.	2 HP.
Height of drill column over gears	89"	98"	98"
Working Surface of Base	29"x45"	36"x60"	36"x88"
Net weight	4000 lbs.	6200 lbs.	7000 lbs.

CANEDY-OTTO MFG. CO.

CHICAGO HEIGHTS, ILLINOIS

HEADS YOU WIN!

UNBRAKO

Reg. U. S. Pat. Office

famous for years as the

KNURLED SOCKET HEAD CAP SCREW

with no premium price!

Heads you win a definite speed-up on the assembly line or wherever cap screws are used. The "Unbrako" *knurling* gears right to the fingers... prevents annoying, time-wasting finger slip... permits faster and farther turning of the screw before applying wrench!

Because of this time-saving advantage, and because the knurling also permits quick and easy locking of the screw after countersinking, many plants are now standardizing on *Knurled* "UNBRAKO" exclusively. Make your next order *Knurled* "UNBRAKO" too!

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA.

Boston
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Chicago
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shows selection of spindle speeds.

Bar feed screw is 4-½" diameter, milled from high carbon special steel screw stock. Heavy Duty ball thrust bearings are provided at ends of screws. Power rapid traverse is connected to screw through sliding gear providing means for moving either front or rear bar support at a speed up to 25 feet per minute.

Boring bar tailstock is of heavy and rugged design suitable for boring long holes of large diameter. It takes a maximum size boring bar of 8" diameter. A hand wheel is provided to set tailstock into position manually. A single lever engages driving nut for both feed and power rapid traverse.

Head bar support contains a driving unit similar to tail support which may be used for feeding short boring bars and also for rapid power traverse. Complete remote and power traverse control are mounted on the bar support.

Spotting carriage is optional equipment and is so designed as to be readily removable from under work and bar after steady rest is in place and boring operation has been started.

Standard carriage, starting carriage, quick change gear box and other extras can be furnished.

Swing over bed is 55½"; Swing over carriage, 42"; Height of centers above shears, 25¼"; Max. boring length one setting (40' bed) 13'0".

Diameter face plate is 48".

Motor h.p. recommended, 30 to 50.

Manufacturers, Simmons Machine Tool Corp., 1725 Broadway, Albany, N. Y.

Bulletin on ¼" Drills

"The Fast, Modern Way to Drill," a new bulletin (JE-112) showing the latest U14 type ¼" capacity, small, light, one-hand electric drills, has just been issued by the Independent Pneumatic Tool Co., 612 W. Jackson Blvd., Chicago, Ill. Containing six pages of information and specifications on Thor ¼" portable electric drills for every industrial application, this circular presents the complete range of models, motor sizes, speeds and switch styles.

Priorities

To assure a steady flow of maintenance and repair parts to essential industries, E. R. Stettinius, Jr., Director of Priorities, announced recently that a new Maintenance and Repairs Rating Plan is available to more than 150,000 producers, manufacturers and agencies in nine industrial classifications. Additional classifications will be added to the list as rapidly as facilities permit.

Those granted the use of the plan will get an A-10 rating which they can apply to their orders for necessary repair and maintenance parts. Although the general rating is A-10, a special emergency rating of A-1-a may be assigned in cases of extreme urgency, but only when telegraphic applications have been granted. They will be granted only in especially urgent cases, such as a sudden breakdown, accident, fire or storm damage.

Industrial classifications to which the plan is available are:

1. Commercial air lines.
2. Explosives manufacturers.
3. Producers of metals and alloys.
4. Mines, including dressing, processing, and smelting facilities.
5, 6, and 9. Public utilities, transit lines, fire and police departments.
7. Railroads.
8. Coke converters.

The A-10 rating is not automatically available to anyone in these classifications. Application must be made on a special form (PD-67) obtainable from the Priorities Division, Maintenance and Repairs Section, 462 Indiana Ave., Washington, D. C., or any of the Division's field offices.

A supplier receiving a preference rated order may extend the rating to his own suppliers.

Mr. Stettinius pointed out that the new plan will benefit essential industries which have need of repair and maintenance parts. It will also aid some suppliers and producers to qualify under Defense Supplies Rating Plan.

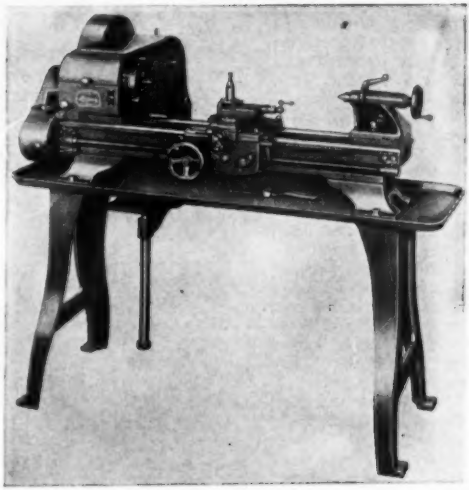
Tanks, airplanes, machine-guns, trucks, tractors, destroyers—these are but a few of the implements vital to the protection and security of our Nation. To be prepared is to avert attack—to be unprepared is to invite it!

Look for the name McGILL! It's your assurance of protection wherever bearings are subjected to the gruelling punishment of today's high-speed machines. McGILL Precision Ball Bearings and "Solidend" *MULTIROL* Bearings give you that added protection in speed, precision and strength, so vital to modern industry.

Send for Catalog — BEARING DIVISION

McGILL MANUFACTURING CO.
1700 North Lafayette Street
VALPARAISO, INDIANA

Logan 10" Lathe



The new Logan back geared screw cutting lathe should be a useful addition to any tool room or machine shop.

It offers 10½" swing over bed and saddle wings; 6-⅛" over saddle cross slide. Distance between centers is 24".

Reversible power longitudinal and cross feeds are provided. Lead screw is ¾" in diameter, 8 threads per inch; 46 thread selections are offered, (r. h. or l.h.) over a range from 4 to 216 per inch.

Width of bed across ways is 6-16/16" and length is 43-⅛". Ways are hand scraped — 2 prismatic V-ways and 2-flat ways.

Sealed, Preloaded New Departure ball bearings are used in the headstock—double row in front and single row in read.

Hole through spindle is 25/32". Maximum collet capacity is ½". Spindle nose diameter and threads per inch—1½"-8". Face plate diameter is 6".

Direct belt driven belt speeds are:—185, 345, 375, 640, 695, 1292; with back gears engaged, 31, 58, 63, 108, 116 and 216.

Cross slide graduated in thousandths has a travel of 6¼". Compound rest top slide is graduated in thousandths and has 2¼" travel. Compound rest swivel is graduated 90° in both directions. Tailstock will set-over for taper turning 11/16". 1/3 or ½ h.p. 1750 motors are used.

Address Logan Engineering Co., Chicago, Ill., for further details.

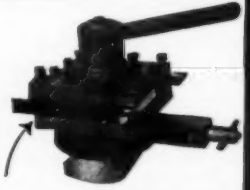
Mead Bandsander

This handy new, low cost belt sander provides 45" of abrasive belt, passing the work at the rate of about 1600 feet per minute. Flexing of the band as it passes over the upper and lower

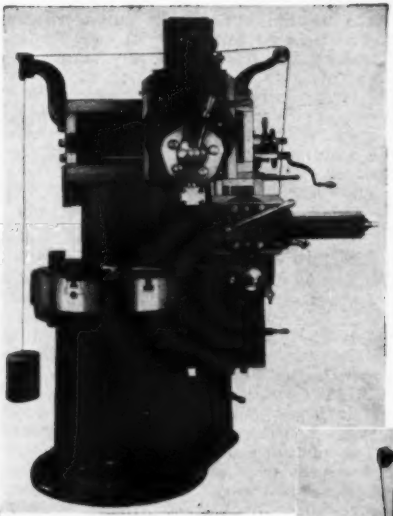
Colwell Tool Post Turrets
are
Helping On Defense Work
by
Speeding Up Lathe Production On Repeat Operations.

80% of the turrets we have sold since 1938 are now being used on Defense Work. Carries four standard tools including cutting-off tool. Note the simple but effective way in which cutting-off tool is employed.

Will quickly liquidate its cost.



S. G. COLWELL, **25 Congress Ave., Providence, R. I.**



(Front View)

ROGERS 36" VERTICAL TURRET MACHINE

EFFICIENT

ECONOMICAL

POWER RAPID TRAVERSE

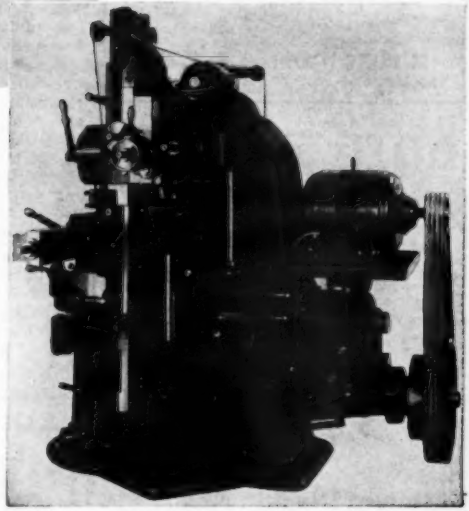
SPEED

PRECISION

QUALITY

RANGE

GOOD DELIVERY DATES



(Rear View)

Manufactured By:

ROGERS MACHINE WORKS
Alfred, N. Y.

Distributors

GANEY MACHINERY COMPANY

135 Arthur St. **Buffalo, N. Y.**

SAVE Labor and Time

Eliminate heavy lifting. Cut handling costs. Table swivels and locks in any position. Can be varied 15½° by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

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MIDWEST TOOL & ENG. CO.
112 Webster St., Dayton, Ohio

TANNEWITZ DI-SAW

SAVES AN AVERAGE OF $4.80 EACH HOUR IT'S USED

Inside and outside cuts on dies, shoes, templets and endless other jobs can be done in a small fraction of the time required by former methods. Saws, files and polishes. A highly developed, large capacity machine.

Write for literature.

THE TANNEWITZ WORKS
GRAND RAPIDS - MICHIGAN

without breaking the arc simply by turning the ball crank handle which gives an infinite number of heat stages, making the units extremely simple to operate.

It is asserted that as these welders are of the a. c. type, difficulty with magnetic blow, slag pockets, or grain structure,. is eliminated, and strong, dense welds can be obtained. These units are built in 300, 400, 500 and 600 ampere sizes by Miller Electric Mfg. Co., Inc., Appleton, Wis.

Handbook on Metal Cutting

Metal cutting suggestions and hints for proper selection and use of Hand and Power Hack Saw Blades and Flexible Back Band Saws are outlined in a small and interesting 20-page handbook just issued by Clemson Bros., Inc., Middletown, New York.

It treats rather extensively on such subjects as hand blade cutting, correct use of blade, blade troubles, selection and care of blade, hand blade recommendations, correct use frame, causes of difficulties; power blade cutting, power blade recommendations; band saw cutting, band saw recommendations; things to remember, etc. Detail construction features, performance and cutting recommendations are given for the complete Star line of Metal Cutting Tools. The book is illustrated throughout with tables, diagrammatical cutting drawings and actual performance photographs.

The purpose in printing this book is to help the user do better metal cutting. more quickly and easily, and suggestions apply to all hack saw blades, regardless of make.

BURR KEYSEATERS

Mill keyways in the run or on the ends of shafting already erected — save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

Write for Bulletins and prices.

JOHN T. BURR & SON
429 Kent Ave., Brooklyn, N. Y.

Relief

Relief rolls cut more than half, nearly to the normal number of unemployables and so-called "chronic reliefers" — employment at the highest rate since 1929—skilled labor shortage so acute that in some instances industry is training women and physically handicapped men for work in defense production — that is the mid-year picture of social conditions derived from a survey last week in 21 key defense cities by the National Ass'n of Mfrs. New conditions such as the closing of silk mills, rationing of gas and shortages of raw materials for non-defense work will probably be felt soon, but the general picture is a pleasant contrast to the gloomy days of mass unemployment.

In one major industrial city alone—Cleveland—120,000 men have marched back to work in less than a year, reducing the unemployment rolls from 137,000 to 17,000. More than 5,000 unemployed were found to be fitted for special defense training. Relief cases were cut from 38,000 to 27,000.

The survey confirms the recent findings of the National Industrial Conference Board. The Board estimated unemployment on June 1, 1941, as 3,962,000, a little more than the total of 3,300,000 in the lush days of 1929.

The Board's report was at wide variance with unemployment estimates furnished the House Committee considering appropriations for WPA which placed the nation's unemployment total at 6,842,000 as of April, 1941.

Solve Your Holding Problems
with BROWN & SHARPE
MAGNETIC CHUCKS
(Permanent Magnet Type)
No Wires—No Heating—No Running Costs
Ask for circular describing the complete line of rectangular and rotary models.
Brown & Sharpe Mfg. Co., Providence, R. I.
For sale only in the U. S. A. and its Territories
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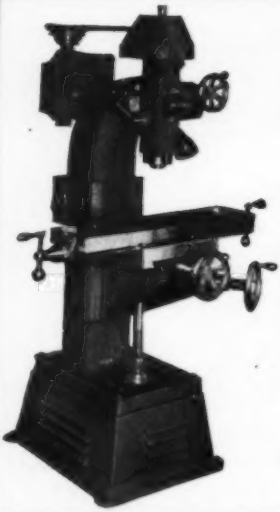


OUR PROMPT DELIVERIES ARE HELPING TO SPEED

THE DEFENSE PROGRAM

JACKSON Vertical and Horizontal High Speed

MILLING MACHINES

A new plant with increased facilities has made it possible for us to accept a limited number of orders for prompt shipment. High Grade in every respect and especially designed for High Speed Precision and Production Milling and Boring.

Wire, Phone or Write

Jackson Machine & Tool Company Sales Division
JACKSON, MICHIGAN

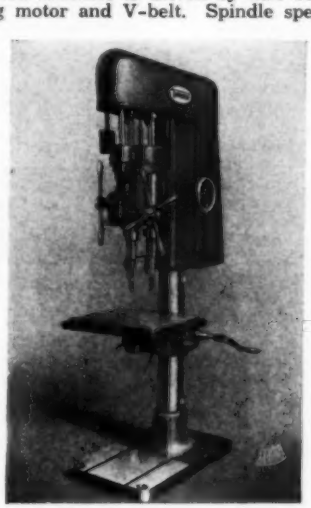
Turret Head Drill Press

The operating principle of a new four-spindle turret drill press announced by Turner Machine Co., Inc., Danbury, Conn., is that the turret is carried on a vertical spindle, about which it revolves horizontally to index the different spindles into working position. Only the spindle in the operating position revolves.

The machine is designed with a turret case that holds the turret rigidly: a detent and socket locks the turret against rotary motion. Spindles are equipped with ball and roller bearings. The machine is built to take No. 2 Morse Taper shanks and will handle drills up to 29/32" and taps up to ½".

The operator can index these spindles easily and quickly so that different operations can be performed without moving the work from one spindle to another. The table will tilt to different positions and can be moved to one side so that work can be held on the base plate.

The machine is driven by ball bearing motor and V-belt. Spindle speeds



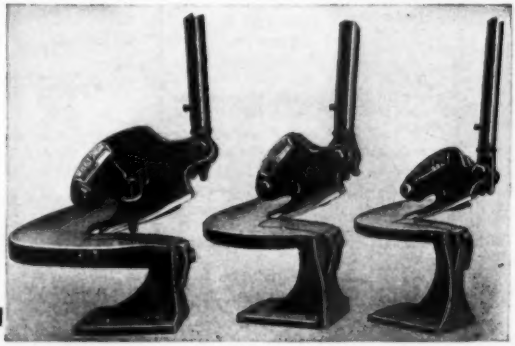
Use BEVERLY SHEARS for those VITAL DEFENSE ORDERS!

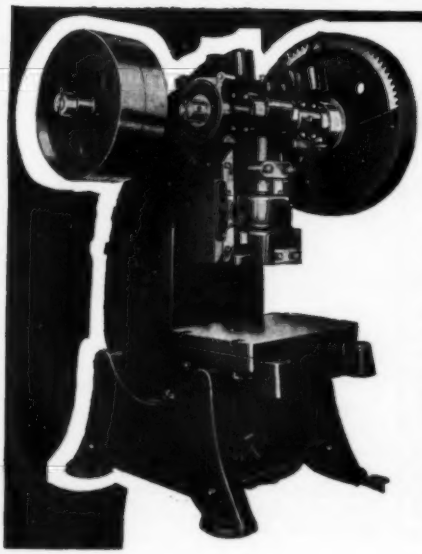
Speed and more speed—that's the watchword on present day RUSH ORDERS! And, BEVERLY "Throatless" Shear is the answer to all your metal cutting problems! Cuts all shapes without distortion! Does it faster with less waste! Low cost too! Get Catalog Now!

The Beverly Line

No. 1—cuts 14 gage, wt.—16½ lbs.
No. 2—cuts 10 gage, wt.—33 lbs.
No. 3 — Equipped with ball-bearing hold-down device)—cuts 3/16 inch, mild steel or 10 gage stainless, wt.—55 lbs.

Beverly Shear Co.
3005 W. 110th Place
Chicago, Illinois





FEDERAL PRESSES for "FEDERAL" JOBS

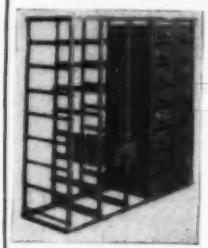
If your plant is called upon to assist in the rearmament program, you need top notch machinery. Federal Presses are now being used throughout the country on government orders. They are proving their worth on every job. Let them help you in obtaining "peak" production at minimum cost.

Write for full details and information.

FEDERAL PRESS CO.
ELKHART, INDIANA

TIDY-UP

with Sterling Racks



Sterling Racks utilize the space above the floor to the best possible advantage. They save time by making contents of all boxes immediately available — no unpiling to get to the right box. Furnished either with or without steel boxes. Made in units of one or five sections —all welded — rigid — non-tipping — non-swaying.

Write for details—tidy-up with Sterling Racks.

STERLING
FACTORY EQUIPMENT CO., Inc.
Providence, Rhode Island.

SHELDON

ARBOR PRESSES

12 sizes ¾—to 10 tons. Bench and Floor Models, Simple or Compound Leverage. Alloy steel rack and Gear.

Milling Machine Drill Press and Shaper

VISES
Plain or Swivel—5 types.

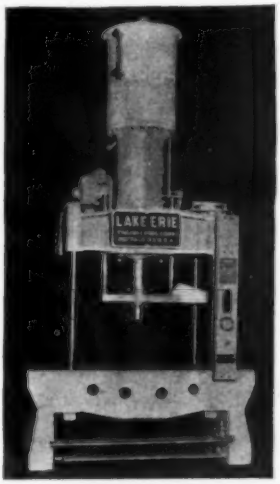
Write for Catalog and Prices.
Dealers: Some Choice Territories still open
SHELDON MACHINE CO.
1629 N. Kilbourn Ave., Chicago

are controlled by a single hand wheel which will give infinite variations within its range. For drilling, three of the spindles have a speed range of 250 to 1620 r.p.m., and the spindle for tapping has a speed range of 85 to 540 rp.m.

Hand feed is 6″ and the swing is 20″. Table is 16½x21″. Table adjustment is 22″. Maximum distance, spindle to table is 23″—spindle to base, 42″. Table swings in 51″ diameter circle.

Straightening Armor Plate

A 100 Ton Hydraulic Press for straightening light armor plate and bars is announced by the Lake Erie Engineering Corp., Buffalo, N. Y.



This type of press with its control of pressure is especially useful for straightening plate which has become distorted or warped due to heat treatment.

The press is self-contained with pumping unit mounted on top. Working space is accessible from all four sides for speed and convenience in handling the material and correct spacing of supporting blocks on working surface of bed.

Lathework

A useful 112-page book on lathework is announced by the Chemical Publishing Co., Inc., Brooklyn, N. Y. Offered at $2.00, "Lathework" was prepared by a staff of experts under the direction of E. Molloy. It contains 127 line drawings and photographs.

A good knowledge of the screw-cutting or engine lathe is very valuable to the man who wishes to become expert in any branch of machine shop practice. It is for this reason that portions of this work have been devoted to the engine lathe, the fundamental principles of lathework, and the application of these principles in actual practice.

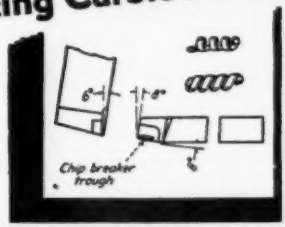
This new volume pays considerable attention to one of the most important of all aspects of modern lathework — the operation of turret and automatic lathes used so largely in mass production and repetition work. Operational details are illustrated by examples from actual practice.

Closely associated with the question of high-speed production is the matter of cutting tools which are used in the lathe. The selection of the right type of tool for the different classes of work is of vital importance to obtain maximum output. The concluding chapter has, therefore, been devoted to cemented carbide tools. Several helpful tables are included.

It is believed that the bringing together of this related information on lathework into a convenient, sturdily bound volume will be appreciated by thousands of men who are today concerned with the setting and operation of these machine tools.

A Simple Chip Breaker Design for Steel-Cutting Carbide Tools

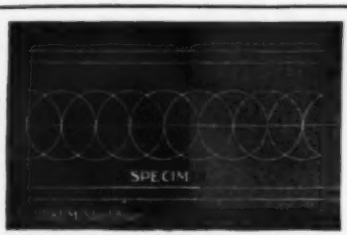
Grooves required to curl and break tough steel chips when machining with KENNAMETAL need not be deep. A gash or trough only 0.010" deep, from 3/32 to 1/8" from the cutting edge, will convert ribbons of steel into neatly broken coils.



GROOVE TYPE CHIP BREAKER FOR CARBIDE TOOLS

This form of chip curler may be ground in free-hand on the peripheral edge of a cup or disk wheel of the loose-bond silicon carbide type. Diamond-impregnated bakelite-bond wheels should always be used when surface grinding in fixtures or on magnetic chucks.

Standard and Modified Standard KENNAMETAL tools are now shipped within 10 days of receipt of order; Standard blanks within 3 to 4 days. Certain Standard KENNAMETAL tools are carried in stock. Write for details.



DYKEM STEEL BLUE
STOPS LOSSES
making dies & templates

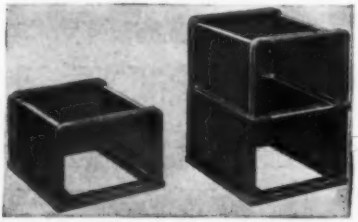
Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information.

THE DYKEM COMPANY
2301G N. 11th St., St. Louis, Mo.
(In Canada: 3194 Dundas St., West, Toronto, Ont.)

Box Storage Racks

A new box storage rack has been developed by Sterling Factory Equipment Co., Providence, R. I.



It is similar to a correspondence transfer case, but is made heavy enough to take the usual shop or tote box. One rack fits into the other and can be built up as high as desired. Any one can set them up and they can be arranged to take advantage of any available space. Rearranging them if first location is not entirely astisfactory, is an easy matter.

Holland Vertical Milling Unit

The new vertical Holland is adapted for precision milling, drilling and boring operations on tools, dies and moulds, as well as for production work.

Column is of the rigid full box construction with knee cast integral. Head is mounted on the vertical slide, with bearings up out of the way from dust and chips. Vertical, table and cross slides are provided with wide, hand scraped ways and fitted with heavy adjustable gibs.

Feed screws are 8-pitch Acme thread, mounted on angular contact ball bear-

ings, adjustable to eliminate end play. The two-piece bronze feed screw nuts are ajustable for wear, and replaceable. The large feed dials are graduated in thousandths.

Graduated 90° both ways, the high speed head can be turned to any angle parallel with the longitudinal feed. The quill is lever fed with depth stop graduated in thousandths. Lower end of spindle is machined for No. 7 B. & S. taper. A wide variety of standard sleeves, collets, arbors and holders is

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MAIN OFFICE AND WORKS: STATEN ISLAND, NEW YORK

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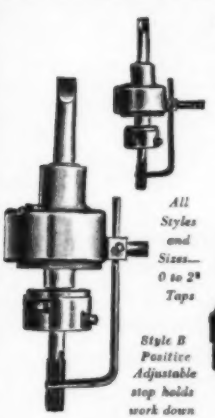
CLUTCH OR CONE DRIVE

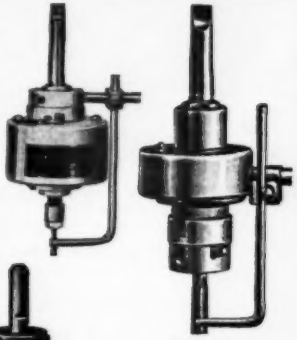
Our High Speed Tappers are Super-Sensitive for Small Tapping



All Styles and Sizes— 0 to 2" Taps

Style B Positive Adjustable stop holds work down

Style D-E, Quick Change Tools



Style C Graduated Adjustable Safety Friction

STURDIMATIC

HEAVY DUTY

LIVE CENTERS

ARE

AUTOMATICALLY COMPENSATED FOR EXPANSION, SHOCK AND WEAR

ARE ACCURATE, DURABLE

WRITE FOR CATALOG AND FREE TRIAL OFFER

STURDIMATIC TOOL COMPANY

5228 THIRD AVE. DETROIT, MICH.

The "27"
MOREY

Semi - Automatic Heavy Duty LATHE

Just the Machine for Shell Work !
Suitable for rough or finished turning shells at maximum feed.
Put your shell operations on this fast powerful lathe and turn out your work at top speed up to the limit of tool capacity.
Multiple tool holders can be supplied at front and rear; a turret mounted on separate saddle can be used instead of tailstock.
Full use of carbide tools can be taken by this heavy duty lathe. ***Ask for Circular No. 715.***

Morey Machinery Co., Inc.
410 Broome Street, New York, N. Y.

The CRITERION
Carbide Tool
Grinder

GREATER PRODUCTION CAPACITY

Provides positive rapid adjustment to meet the rigid requirements of production tool manufacturing. Built for continuous service. Adjustable coolant system. Large work tables instantly adjustable without wrenches or other tools. One-third H.P. balanced precision bearing motor completely enclosed and radially mounted in rubber. Standard equipment. One 60 and one 100 grit 7" dia. steel backed silicon carbide wheels. Ideal for metal bonded or Retinoid bonded diamond wheels.

Order from your dealer or write direct. Request literature. No obligation.

CRITERION
MACHINE WORKS
BEVERLY HILLS CALIFORNIA

available from local jobbers to fit this taper. Quill is chromium plated. Ejector type draw bolt is supplied. Spindle is mounted on ultra-precision preloaded ball bearings.

Longitudinal hand feed is 16" while cross and vertical feeds are 8". Spindle to column dimension is 8-¾". Maximum distance, spindle to table is 11".

Table working surface is 8x26", with three ½" Tee slots. Seven spindle speeds are provided over a range from 525 to 4000 r. p. m.

Full details may be obtained from Marburg Brothers, Inc., 90 West St., New York City.

Silver Solder Brazing Unit

A new electric unit for brazing and soldering with silver solder is announced by the Ideal Commutator Dresser Co., 1035 Park Ave., Sycamore, Ill.

The Brazer operates on 230 volts, 50-principle as the "Thermo - Grip" soft soldering tools. It comprises a power unit or transformer and a pair of electric heating pliers. Holding the part to be brazed in the pliers, closes the secondary circuit causing the part to

A VERY POPULAR MACHINE FOR THE MACHINE SHOP
⅓ H. P. CAPACITY
TYPE M5A

Strand
FLEXIBLE SHAFTS

GOOD TIMES
OR
BAD TIMES
IT PAYS TO BUY
GOOD TOOLS

FLEXIBLE SHAFT MACHINES
AND
ATTACHMENTS

COVERING HUNDREDS OF OPERATIONS

WE BUILD
HORIZONTAL AND VERTICAL TYPES
FROM ⅛ TO 3 H. P.
HIGH QUALITY MACHINES
AND
FLEXIBLE SHAFTS

Since 1905

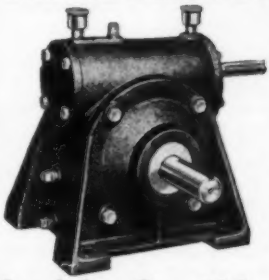
N. A. STRAND & CO.
5001 N. Wolcott Ave. Chicago

¼ H. P.
TYPE M Y 4

Janette Speed Reducers

PROFIT BY OUR EXPERIENCE

The ruggedly constructed Janette speed reducers are used the world over because of their remarkable reliability.



Since 1909, Janette has been building geared equipment with outstanding success. Many vitally important industrial machines that MUST NOT FAIL, depend upon Janette gear units.

There are 47 foot and flange sizes, in 16 different mounting positions; with motors from 1/50 to 10 H.P.; built to give speeds from .08 to 1140 r.p.m., available for driving your slow speed machines.

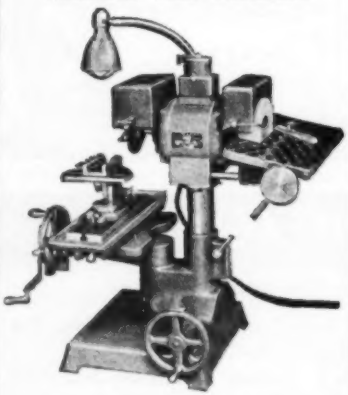
Send for Our 100 Page Catalog

Janette Manufacturing Company
558 West Monroe Street Chicago

heat quickly to brazing temperature. Heat is accurately controlled by On-Off foot switch. Jaws are removable, permitting the use of special shapes of jaws for special jobs.

When in use, cover turns back making a convenient shelf for flux, silver solder, etc. When not in use, all parts can be enclosed in the streamlined cabinet which is readily portable on easy rolling casters. Overall size is only 14 x12x25". Weight, 100 lbs., (60 cycle unit), 150 lbs. (25 cycles).

Every *MODERN* Plant *NEEDS* This Machine



Universal Carbide Tool Grinder

If you employ cemented carbide tipped tools in your plant you will want to know that this machine tool performs all the necessary operations for their upkeep. If you don't—well, excuse us for wasting your time and our own.

Bulletin CTG40-8H gives you details.

K. O. Lee Company

Aberdeen, South Dakota, U. S. A.

The Brazero operates on 230 volts, 50-60 cycle power supply. 440 volt and 25 cycle units are also available. Rating is 7½ KVA. Secondary voltage is reduced to 10 volts. Heating pliers have 6-¼" throats. Face of carbon is 1-¾"x2" but may be filed to shape best suited for a particular job.

Uses for this tool are almost unlimited—Silver soldered joints can now be made easily and quickly in motors, transformers, electrical leads, lugs and terminals, bus bars, automobile engines, air craft engines, water heaters, fittings, carbide tool tips, band saws, etc.

Furnace Equipment Catalog

The Johnson Gas Appliance Co., 602 E. Ave., N. W., Cedar Rapids, Iowa offers a new catalog which pictures and describes their entire line. Among the new items shown are the No. 130 Hearth Type Furnace; the No. 570 Pot Type Hardening and Melting Furnace; No. 34 "Pre-Heating" Torch; the No. 305 M W Bunsen Burner which can be mounted parellel with the pot, tank or vat; the No.80 Slot type Burner for heating large areas, and the Automatic Air-gas proportioner. Also included is a chart showing correct Carburizing and Heat-Treating Temperatures and a Heat Color Chart.

Heavy Duty Sander

Black & Decker Mfg., Co., Towson, Md., have developed a 9" heavy-duty production Sander to meet demands for faster schedules. It has been designed for constant production-line use with 9" abrasive discs.

The makers assert that every feature from its sturdy, full-powered Universal motor to its new spindle-lock for quick disc changing will help do a faster, better metal surfacing job at less cost. Full details are given in a new bulletin.

Optics

The story of how optics was introduced to America and how it developed many ramifications is condensed in a 25-page booklet announced by Bausch & Lomb Optical Co., Rochester, N. Y.

"The Story of Bausch & Lomb" begins with an interesting introduction which declares that "America is a country of alloys, not only of steel, nickel, and tungsten, but of people." We combine the intelligence of a Michael Pupin, a Serb, with the thrift and energy of Carnegie, a Scot. We blow on the spark of genius in a Steinmetz, a German, or Tesla, a South Slav. We welcome an Agassiz from Switzerland or an Augustus Saint-Gaudens from France.

Various commotions in Europe have often redounded to our advantage. It was the German Revolution of 1848 that drove such men as Carl Schurz, John J. Bausch, and Henry Lomb to the United States, along with thousands of other thinkers, technicians, and artisans.

Trained in optics in Germany, John Bausch after several years succeeded in introducing the craft in America. In time the business grew and in 1917-18 it filled an important role as a chief source of our military optical glass.

This new illustrated booklet gives an excellent review of the optical industry of today and its functioning. The raw materials of optics are discussed. Several pages point out the great importance of pots in glass making. The problems of lens molding and grinding are outlined. It is also pointed out that metallurgy is important because of the necessity of mounting optics. The countless and diversified applications of optics are also reviewed.

★ Which means saving crane time, welders' time and helpers' time in getting better welds ("down-hand" at all points) faster.

C-F Welding Positioners in capacities from ½ to 7 tons, are production machines. Fasten your assemblies to the table and by hand or motor, under full control of the welder, the load can be tipped 135° or turned 360°. The table may be adjusted in height for handling very large assemblies.

C-F Welding Positioners make production welding cheaper, faster and better for many industries, as described in our Circular WP-20. You should have a copy. It will be sent without obligation, upon receipt of coupon.

FlexoiD Dependable PRODUCTS

FlexoiD Industrial Couplings

with Thermoid Hardy discs

FlexoiD Tool Holders

WITH UNIVERSAL HEAD

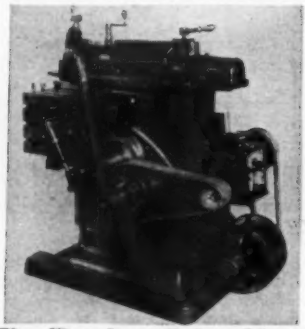
"It's all in the Tool"

sent on 30 day trial

FlexoiD Speed Control

4 and 8 speed models

Converts old machine tools into modern individual drives



FlexoiD unit applied to S haper

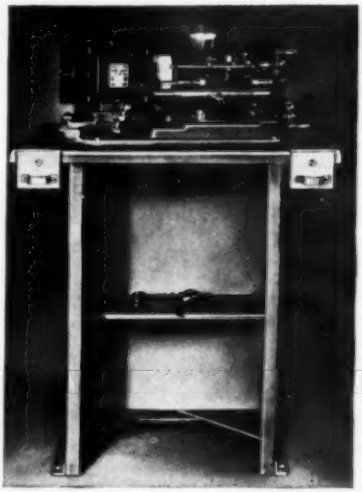
Write for complete details or wire collect for information regarding nearest distributor.

The Smith Power Transmission Co.

1545 E. 23rd St., Cleveland, Ohio

"J-B" Tap Grinders

The Edward Blake Co., 634 Commonwealth Ave., Newton Centre, Mass., announces the new No. 1 and No. 2 J-B Tap Grinders and a new J-B Tap Grinder Knee-Room Pedestal.



These machines are designed for sharpening taps on the chamfer. They will sharpen 2, 3, 4 and 5 flute taps and may be equipped for grinding 6 flute taps or 6, 8 and 10 flute taps. Both right and left hand taps may be sharpened.

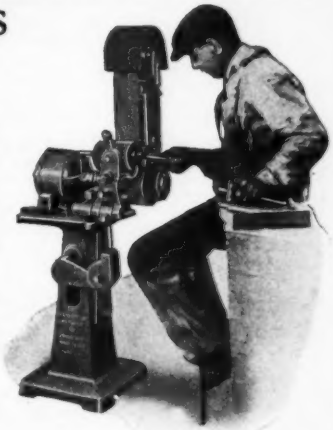
Capacity of the No. 1 J-B Tap Grinder is as follows:—taps held on O. D. of thread — any length — No. 0-½"; taps held on shanks — any length — No. 0-⅝"; taps held on centers — lengths under 5"—No. 0-2".

The No. 2 J-B Tap Grinder is similar to the No. 1 except that it is furnished with a 10" extended bed for sharpening the chamfer on taps up to 12" long, held on centers.

Taps may be inserted or removed from the machine in a few seconds, and a simple locating device insures correct positioning and duplication of

QUICK DELIVERIES POSSIBLE

If you use this Type S Polisher and Surfacer

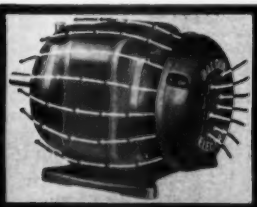


You will be able to increase production because the Type S is versatile. It combines a centerless feed polishing machine—a vertical or horizontal belt grinder—surfacer or polisher. Suitable for metal, rubber, fibre, wood or anything that can be ground or polished, it has no equal for cylindrical polishing or straight line finishing on flat work, on small diameters and sizes. Can be changed for hand feed and from vertical to horizontal in few seconds. Cylindrical work ¼" to 1" in diameter may be fed automatically without centering or chucking.

Other Types—Also Reed High Speed Sensitive Drills and Greenfield Universal Tool Cutter Grinders.

Production Machine Co.
GREENFIELD, MASSACHUSETTS

NEWEST DESIGN
Cool-running MOTOR



Illustrating forced air-movement over entire exterior of motor frame.

BALDOR Streamcooled Design provides a totally-enclosed, ball-bearing motor with an unfailing, NON-CLOGGING cooling system.
BALDOR Glass-insulated motors withstand higher temperatures SAFELY and provide MORE H.P. in smaller frame sizes.
These and many other features at NO EXTRA COST to you.

BALDOR

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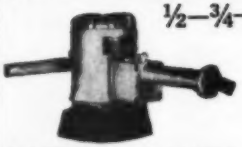
BALDOR ELECTRIC CO.
4368 Duncan Ave., ST. LOUIS, MO.

BETTER MOTORS

CUTS GRINDING COSTS

½—¾—and MORE



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3 Phase
60 Cycle
No Brushes

GASTON POWER TOOLS
2655 W. 95th St., Evergreen Pk. Ill.

Release Large Machines for Heavier Work—

Put small jobs on this **LINLEY** Vertical Milling Machine and Jig Borer.

This machine is ideal for tool, die, fixture and pattern work. Is versatile, and accurate. Micrometer screw feed quill. Direct reading eliminates pencil figuring and possible errors. Smooth, accurate boring is assured to any predetermined depth up to 3".

Write for descriptive Bulletin

LINLEY Brothers Co.
11 Montauk St.,
Bridgeport, Conn.

work. The desired relief is obtained by a simple screw adjustment of an eccentric mechanism. The motor head unit may be swiveled in a wide arc on any desired chamfer angle.

The makers emphasize that the machines are accurately and ruggedly built, and rapid and positive in operation, requiring little or no special operating training. They are profitable shop tools because substantial savings can be made by sharpening and resharpening valuable taps which formerly had to be discarded.

The Grinders are furnished complete with motor, two grinding wheels, wheel guards, diamond wheel dresser, wrenches, one draw-in master collet, and two bell centers.

The Pedestal may be furnished as an optional extra. It is designed for maximum efficiency for either the seated or standing operator. Two drawers are furnished for storing extra bushings, wrenches, and other tools.

NUMBERALL
Numbering Machines
Automatic and Hand Operated

for stamping in Metal, Fibre, Plastics, etc. Do faster and better work than Single Steel Stamps.

For Marking Metal Parts, Name Plates, Metal Checks, etc.

Write for Catalog.

NUMBERALL STAMP & TOOL CO., Inc.
Huguenot Park, - - - Staten Island, N. Y.

SHARPLY DEFINED *Scribed Lines*

Micro *Supreme*

LAY-OUT DYE

Manufactured by

MICHIGAN CHROME & CHEMICAL CO.

6346 E. Jefferson Ave., Detroit

Be Sure to Take Advantage of This Special

TRIAL OFFER

60¢

Transformers

A recent offspring of Westinghouse research is "Hipersil," an improved magnetic material which, used in transformer cores, is said to have one-third greater flux-carrying capacity than the best conventional silicon steel. In carrying this increased flux it requires no more magnetizing force and its losses will be no greater. Furthermore, its magneto-striction, or sound-producing property, is reduced so that increased magnetic flux causes no increase in hum.

In its first application it has reduced size and weight of distribution transformers as much as 25%; has facilitated reduction of copper losses some 10% and thereby increased short-time overload capacity.

A crystal of any magnetic steel is cubical in form; is easily magnetized along its edges, less easily along its diagonal. If these molecules could be packed face to face like toy building blocks in a tray, the material would be easily magnetized in any one of six directions and would be perfectly "grain orientated." Ordinary silicon steel has little or no grain orientation, but the special process of producing Hipersil results in orientation in one direction (that of rolling); hence the material is easily magnetized in this direction.

Under a magnetizing force a piece of steel elongates, then contracts when the flux collapses. The movement is extremely small—only about 12/100,000" for a core 4' long. The resulting noise, however, may be annoying.

This cyclic dimensional change is less in Hipersil than in ordinary silicon steel at the same flux density.

• Your lubrication problems, whether large or small, will find the correct answer in the Gits Line. If your requirements are of special nature, send us your specifications.

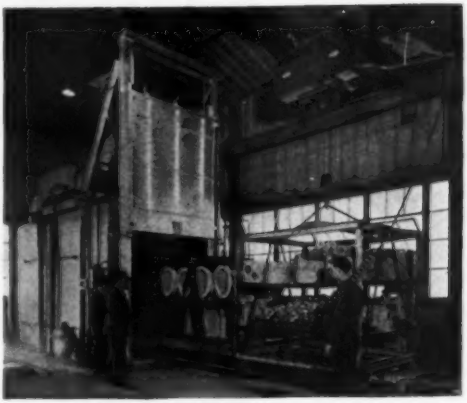
GITS BROS. MFG. CO.

1860 South Kilbourn Ave. Chicago, Ill.

30 years of oil cup experience

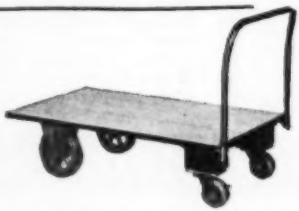
Panel Section Heat Treating Furnace

A new type of heat treating furnace construction that fits well into the needs of the Defense Program is announced by Despatch Oven Co., Minneapolis, Minn.



One of these new furnaces is shown in use in the heat treatment of aluminum alloy castings such as aircraft engine blocks, tank rear axle and transmission cases, aircraft engine oil pans, turbine wheels, fans and fan parts, gas manifolds, bomb turret casings, Diesel engine frames, Diesel crank shaft housings, etc.

While this particular furnace is excellent for the solution heat treatment and aging treatment of aluminum alloy castings it is also highly recommended for tempering and drawing of alloy steels, normalizing and stress relieving of castings and welded sections, and numerous other heat treating processes requiring a temperature range up to 1200° F.



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FACTORY TRUCKS

ALL SIZES AND TYPES

SEND FOR CATALOG

Mfr.
RACKS
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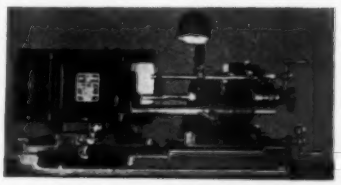
ALL-STEEL WELDED
TRUCK CORP.
ROCKFORD, ILL.

GET ACCURATE
CHAMFER SHARPENING



With the **J-B** Tap Grinder you can sharpen 2-3-4-or 5 flute taps, right or left hand. Grind uniformly and accurately on any taper or angle of chamfer. Taps are quickly and accurately set.

Taps sharpened on the **J-B** stay sharp longer.

Send for additional information today !

EDWARD BLAKE CO.
635 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

"ABRASAW"

BRIDGEPORT No. 47W
Wet Cut-Off Machine

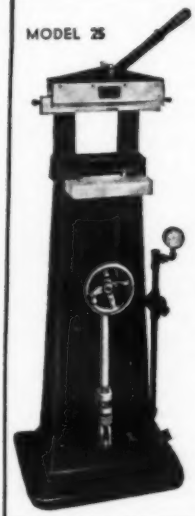
More, better and cheaper cuts on practically all materials, are produced by the new Bridgeport "ABRASAW". Cutting speeds are unbelievably fast, material is handled with facility and the polished cuts often eliminate secondary operations.

Capacity 2" in tubing, 1" in solid bars. Our model 48-W handles 3½" tubing, 2½" solid bars.

Let us send bulletin giving full details.

Bridgeport Safety Emery Wheel Co., Inc.
1304 West Broad St., BRIDGEPORT, CONN.

MODEL 25



MARK YOUR PARTS
Permanently

PART NUMBERS, CATALOG NUMBERS,
HEAT NUMBERS, SERIAL NUMBERS,
PATENT NUMBERS
MANUFACTURER—INSTRUCTION DATA—INSPECTION

Positive, Permanent marking on your products assist prospects to order. Makes it easier to buy—new, repeats and repairs. Gives you a definite record of pertinent data on each part produced.

The Pneumatic marking machine illustrated is our HI-DUTY model 25 general purpose tool for short runs or production work. It operates from your shop air line and is one of numerous models built to produce neat, permanent markings quickly on metal fabrications.

We will be happy to make specific recommendations upon receipt of samples or prints of parts to be marked, showing approximate lettering, its location on the part, with required hourly production.

MARKED PARTS ADVERTISE
IN THE RIGHT PLACE, AT THE RIGHT TIME.

Send for complete catalog of our full line of marking Tools, Machinery and Equipment.

GEO. T. SCHMIDT, Inc.
1802 Belle Plaine Ave., Chicago, Ill.

Lewis Semi-Finished

BENCH MILL

A PRECISION MILL AT A SENSIBLE PRICE!

Ideal for many uses. All major machining operations finished to high degree of accuracy. Perfectly designed, shop-tested, trouble-proof construction. Exceptionally efficient. Stands severest service. Handles full range milling work. Table 3⅛"x18", travel 12", cross feed 5¼", vertical 7". No. 3 Morse Taper in spindle. ¾" center hole adaptable for collet attachment. Complete — including materials, blueprints and LEWIS COUNTERSHAFT castings.

Send today for new 1942 Catalog.

LEWIS MACHINE TOOL COMPANY

P.O. Box 116, Sta. A, Dept. Z-9 Los Angeles, Cal.

BUY WHITNEY-JENSEN METAL-WORKING MACHINERY and HAND TOOLS for LONG LIFE and ACCURACY

BENDING BRAKES

20 ga. 49 in. to 12 ga. 10 ft.

Whitney-Jensen brakes cover a wide range of most useful sizes and types. Moderately-priced, of high quality and durability, they are a worth-while investment for any shop doing sheet metal work.

Write for Catalog No. 14

12-14-16 ga. 4-5-6-8-10 ft. sizes.

WHITNEY METAL TOOL COMPANY

115 FORBES STREET • ROCKFORD, ILLINOIS

The furnace shown may be fabricated quickly in special panel sections. Complete erection, ready for maximum production, requires only eight days. Because of the special panel construction, the furnace may be moved easily if required, or it can be enlarged quickly for greater production.

Three large furnaces of this new panel type are installed at the National Bronze & Aluminum Foundry Co., Cleveland.

Inside working dimensions are 7′ wide, 8′ high and 15′ long. The overall dimensions are 10′ wide, 16′ long and 9′ high not including the heater equipment on top of furnace.

Approximately 5000 to 7000 pounds of aluminum castings are placed on the car as shown. Through a special gear rack system on car, it can be quickly run into furnace after loading.

Sensitized Metal

Because of the interest shown in their sensitized aluminum sheets, as well as because of recent OPM rulings restricting aluminum, Republic Engineering Products, Inc., 480 Lexington Ave., New York City announce a new process whereby they are now able to supply other materials such as steel plate, brass, copper, various steel alloys as well as plywood and plastics coated with sensitized emulsion suitable for making photographic copies of all kinds and for all purposes, including pictorial and enlarging types.

Some of these sensitized materials can be obtained in any commercial thickness such as ⅛" or ¼" cold rolled steel—the type used for making templates. The drawing is photographed directly on the sensitized surface and then developed. This saves considerable time because it is not necessary to have the toolmaker first sketch the drawing on the template by hand.

The sensitized metal is also suited for name plates, instrument dials, escutcheon plates and permanent instruction sheets. For those who do not wish to do their own photographic work, commercial photographers in various sections of the country will do the necessary processing.

Air Directory

"Aerosphere - 1941" is announced by Aircraft Publications, 370 Lexington Ave., New York. This comprehensive yearbook contains 948 large - size pages with 933 photographs and illustrations. Published at $10 plus shipping charges, it is a mine of information on aviation.

The four major sections of this volume are: — Modern Aircraft, Modern Aircraft Engines, Aircraft Statistics, and Buyer's Guide.

"Aerosphere - 1941" is published for the dual purpose of being a useful daily working tool in all branches of the aviation industry and completely informative to the alert lay reader who searches for basic knowledge of the aviation industry.

The aircraft section contains photographs, cutaway and sectional drawings of private, military, and commercial planes now being built throughout the world. Design, construction, and performance are described.

Engines of 118 manufacturers are described and illustrated. Both today's engines and many under development are included.

The section on aircraft statistics is a remarkably complete collection of useful and interesting information. Just a few of the many subjects treated are:—airplanes of the U. S. Army, Navy, and Coast Guard, with photographs; official world air records; air line and air mail data; analysis of causes of accidents; and U. S. plane production.

The "Buyer's Guide" lists all of the known aircraft manufacturers of each country alphabetically. An extensive product index is also given under each country. In addition, there is a geographical list of United States manufacturers.

Note this Built-in Adjustable Angle Wheel Truing Device
RUGGED
enough for heavy PRODUCTION
LOW-PRICED
enough for your SINGLE PURPOSE Applications
COVEL NO. 15. Hand Feed 6" x 18" SURFACE GRINDER
-shown here set up for grinding multiple-jaw clutches having straight or taper-faced teeth... Defense industries can obtain early delivery on the No. 15....
Write, wire or phone for Bulletin 440 and name of your Dealer.
COVEL INDUSTRIAL GRINDERS
COVEL MFG. CO., BENTON HARBOR, MICH.
Grinding Machinery Since 1874

SAVES YOU TIME—MONEY—SPACE

Saves time because all stock is in view. No looking around. Saves money because original cost is low. Saves space because very little required. 4 arms, 51" high, stacks 10,000 lbs. flat or round stock. 5 arms 57" high 12,000 lbs. Tubing less weight — 3 stands for 20' lengths or 2 for 12' or shorter. Use against wall or back to back in center of room. Small cost—big value.

WM. S. YOHE SUPPLY CO.
503 Mahoning Rd. N. E., Canton, Ohio

—GEARS—

Spur—Helical—Worm—Bevel—Miter, Etc.

We do broaching and all kinds of grinding.

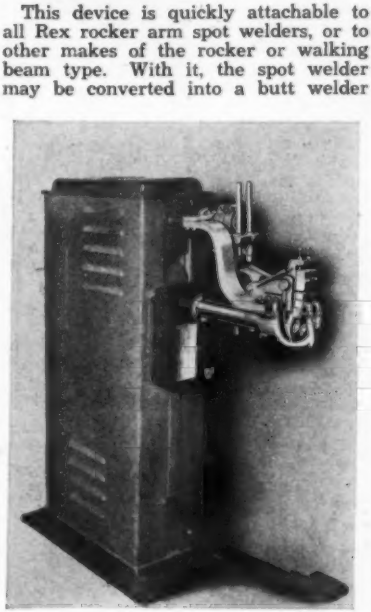
We specialize in grinding hardened steel bushings, cam rollers, etc.

Prompt service and quality has retained a large list of customers for 25 years.

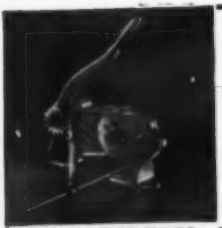
TAYLOR MACHINE CO.
1919 E. 61st St., Cleveland, Ohio

Butt Welding Attachment

This device is quickly attachable to all Rex rocker arm spot welders, or to other makes of the rocker or walking beam type. With it, the spot welder may be converted into a butt welder



by simply removing the horns and inserting in their place, the upper and lower sections of the unit. No cables or rods to the foot pedal are needed, as the entire operating action is made wholly automatic by movement of the upper arm.



★ THE WONDER CUTTER ★

The lowest-priced wire and rod cutter on the market. The hardened cutters last indefinitely. Hand operated. A giant for work, cuts wire and rods up to ⅝-in. round or ⅝-in. square and band iron up to ⅛" by 2-in. Adjustable stop for repeated cuts to same length. Large or small, your shop can use a WONDER CUTTER.

Write today for prices and trial offer.

THE FEDERAL FOUNDRY SUPPLY CO., 4602 EAST 71st STREET CLEVELAND, OHIO

The single operation of stepping on the pedal clamps both jaws simultaneously, pushes the movable die toward the stationary side, applies the welding current, completes the weld and upset and pulls the slide back to start position. It is asserted that the abutting surfaces are rapidly forged together and a uniform weld obtained, free from porosity and approximately equal to strength of the parent metal.

The attachment provides two resistance welding units—a butt welder and a spot welder at little more than the cost of a spot welder alone. It is made by Dyer Welder & Engineering Co., 7 E. 19th St., Kansas City, Mo.

Motorized Hoppers

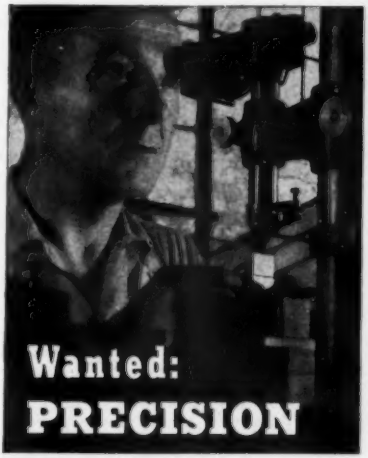
A new product has been added to the line of magazine feed power screwdrivers by the Detroit Power Screwdriver Co., 5363 Rohns Ave., Detroit, Mich. They have designed a new Motorized Hopper Unit that is adaptable to hydraulic or crank presses, riveting machines, grinders and special machines.

These hoppers will feed screws, screw blanks, nuts, rivets, pins, plain washers and many various special parts that are adaptable to the hopper. They are made in three sizes, 10, 12 and 16" diameters and powered with a special 1/10 h. p. ball bearing motor designed for constant service at 1725 r.p.m. Motor bearings are sealed in grease and hopper operating gears run in an oil bath.

A special friction design of bevel gear is used to prevent damage to motor or gears should some foreign part get into hopper and jam or lock it. Two types of brackets for mounting hoppers are available for adaptability to various types of machines.

Small nuts, pins and washers are fed down the track as high as 500 pieces per minute and larger pieces in proportion, according to size and ease of pick up.

The company invites sending of samples to determine quantity of pick up and hopper size.



PRECISION is tremendously important in the manufacture of vital defense implements.

A *standard of accuracy* is especially imperative for the thousands of scattered industrial plants now under contract to make different parts for assembly at central points.

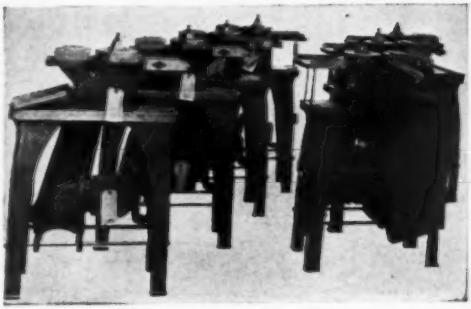
Johansson Gage Blocks and Accessories are unexcelled as a means of achieving—and maintaining—the *highest precision* for defense production.

FORD MOTOR COMPANY

Johansson Division
(Dept. C)
Dearborn, Michigan

JOHANSSON GAGE BLOCKS

Marking Conical Fuse Caps



Wm. A. Force & Co., Brooklyn, N. Y., have just completed a battery of 11 power-driven rotary marking-machines for the Proctor & Gamble Defense Corp. These new machines are to be used for numbering and marking conical fuse caps. Using a turntable as an anvil, the caps are rolled across the face of a standard Force indenting - marking head which provides space for interchangeable steel marking dies.

The machine is powered with standard motors, and speed is governed by standard reducing gears. For ordinary numbering and marking, speeds of over 5000 per hour can be maintained by comparatively inexperienced help. Where numbers are required to register accurately in given positions, speed is considerably reduced but the machines will still turn out over 1500 per hour.

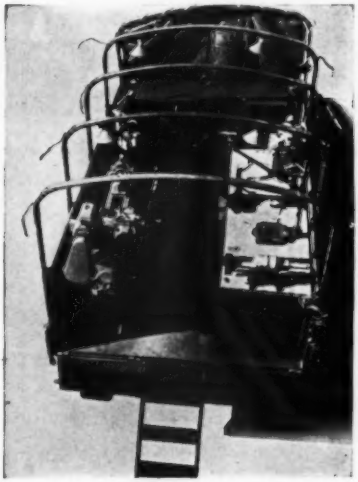
In order to expedite delivery, Force engineers designed this new equipment for assembly from stock items — the only special parts requiring individual tooling are the interchangeable impression rings on the turntable and the

holder for numbering head and dies. These parts can be quickly manufactured in the Force plant.

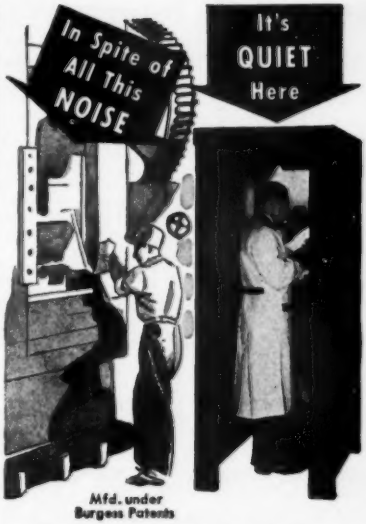
Additional orders for similar equipment are now in work for other defense projects for the new machines, with minor variations, work efficiently on all sorts of conical or cylindrical parts with level, convex or concave surfaces—and on practically any material including alloy steels.

Army Machine Shop On Wheels

Pictured here is one of the Army's newest shop trucks, shown by courtesy Hobart Brothers Company, Troy, Ohio.



Each unit contains a lathe, brake reliner, power generator and arc welder, valve refacer, vise, drill stand, and grinder. These efficient mobile shops enable army machines to go wherever there is trouble—saving many valuable minutes of repair time.



This Acousti-Booth Makes Telephoning Easy in Noisy Places

No matter how noisy your shop may be, you can telephone in comfort in a Burgess Acousti-Booth. The patented, sound-absorbent walls of this handy booth soak up factory noise and give you a "zone of quiet" for easy telephoning. It has no doors because no doors are needed.

There are no mechanical parts—hence no maintenance is required. Open bottom makes the booth easy to keep clean. Used in hundreds of plants with complete satisfaction. Send coupon for full details.

Mail Coupon for Free Booklet

Burgess Battery Company, Acoustic Division
520 W. Huron St., Chicago

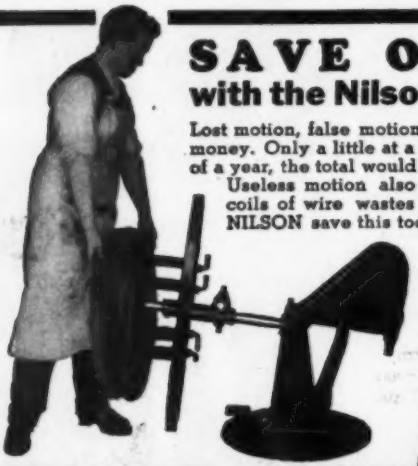
Please send Free booklet describing Burgess Doorless Acousti-Booth and how it makes telephoning easy in noisy places.

Name----------

Firm Name----------

Street-City----------

BURGESS ACOUSTI-BOOTH



SAVE ON LIFTING
with the Nilson Tilting Wire Reel

Lost motion, false motion and unnecessary motion all cost money. Only a little at a time perhaps, but over the period of a year, the total would be impressive. Why not save this? Useless motion also represents a loss. Lifting heavy coils of wire wastes time and energy. Why not let NILSON save this too?

A foot lever is tripped, the guards removed, a coil of wire slid upon the carrier, the guards replaced and set screws tightened, an easy lift, and the counter-balancing weight does the rest, bringing the tilting section to a vertical position, ready to feed the wire into the machine.

Send today for Bulletin No. 51 and learn how you can in other ways too.

The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.

Barnes Precision Cutter Grinder

Already used by many makers of small arms and similar precision parts, this Grinder handles gangs of formed or plain cutters, or combinations of such, concave, convex or angular cutters, shell, shank and form turning tools. It will grind formed or other cutters with undercut or spiral teeth, and as the Barnes method uses as a starting point for all subsequent operations, a templet of the exact outline it is desired to maintain, the actual grinding does not require a high degree of skill on the part of the operator.

Essentially, the machine comprises a plane table with grinding wheel supported above it. The wheel is adjustable, forward and backward, by means of a slide and a screw. A former pin projects from table surface and forms at its top, a rest for the tooth of the cutter. Height of this rest is fixed, and is at such a distance below center of wheel as to give cutter tooth a standard degree of clearance.

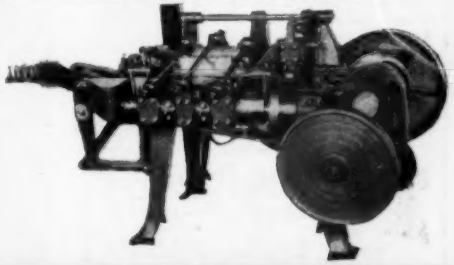
CHECK THESE FEATURES

of the Nilson Automatic Metal and Wire Forming Machine

- Open construction of press and forming tools.
- Patented slide feed with an independent cam-operated wire gripping device.
- Power operating wire feed is transmitted through a straight line.

The NILSON AUTOMATIC Metal and Wire Forming Machine meets Today's industrial requirements. Engineered with a 50-year back-ground of experience in designing and building metal forming machines, this S-3-F machine is setting new records in speed and uniformity of products.

Write TODAY for information on all types of metal forming machines



The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.

A clever wheel truing device is provided with a V-groove for engagement with the former pin and an adjustable diamond for the truing operation.

A cutter jig slides freely over the table surface on hardened feet. It carries a horizontal cutter arbor having its center line at a height equal to that of the top of the rest. Underneath it carries a templet, the front edge of which conforms to the required shape of the cutter or gang of cutters. Means are provided for adjusting cutter arbor longitudinally and the templet transversely without disturbing the parallelism existing between them.

In operation, cutters belonging to a gang are assembled on the arbor, usually with standard distance collars between. The cutters are then brought into vertical alignment with templet with the aid of a cylindrical square. Then, it only remains to rest each cutter tooth in turn on top of rest and move jig past edge of wheel, keeping templet in contact with former pin. For ordinary work, former pin is provided with a bearing sleeve ⅜" in diameter. It will consequently grind convex profiles of any radii and all concave profiles of which radii are not smaller than 3/16". For sharp internal angles and for concave profiles of smaller radius down to .010" or less, a special small radius former pin sleeve is available.

The makers emphasize that this Grinder makes it possible to extend the use in general practice of the profile form of tooth cutters of very complicated shapes.

Address General Machinery Corp., 140 Federal St., Boston, Mass., for bulletin giving complete details.

Midget Marvel Flexarc Welder

For use in welding light gauge metal, castings and drive shafts, general maintenance, and light production work, a new Flexarc welder is announced by Westinghouse.

Known as the Midget Marvel WT-1, this a.c. welder comes complete with all accessories, even to primary cable

ALPHIL
Spot Welders
More Production Lower Cost!

Features include: transformer which guarantees faster heat, stronger welds; water cooled electrodes and tips; automatic trip switch; adjustable arms; swivel pedal; and heat regulator.

If you have any production problems—*consult* us.

Alphil Spot Welding Co.
431 W. Broadway, New York, N.Y.

Hartford Bench Taper Gage

This gage has been developed to not only meet tool-room requirements, but manufacturing requirements.

It is made in a most substantial manner of the best materials. The gage plates are hardened and ground. In operation the gage sets on a bench convenient to the workman. It is adjusted to the height of his eyes, and placed so that he looks toward the light through the gage. The gage plates are set to a master plug gage. It is found much more accurate and rapid to operate than a ring gage.

Height to center line of gage: greatest, 30¼ in.; least, 23¼ in.; weight, 23 lbs.

Capacity—From nothing to No. 14 Brown & Sharpe taper.

Built and sold by

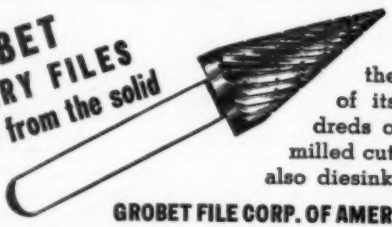
The Hartford Special Machinery Co.
HARTFORD, CONN.

for hooking up power line. Included in the accessories are electrode lead and holder, work lead, helmet, and a supply of electrodes.

Sensitive adjustment of welding current over a range of from 20 to 140 amperes is provided by 15 steps with correctly proportioned increments between steps. Full load rating is given as 110 amperes, 30 minutes, 30 load volts, when used on 220 volt, 60 cycle lines. The cost of power consumption is said to average about 5 cents an hour depending on local power rate.

Approximate dimensions are 14-½ by 12-⅛ by 20" long. Weighing only 160 lbs., the welder is supported on casters to facilitate mobility.

GROBET ROTARY FILES ground from the solid



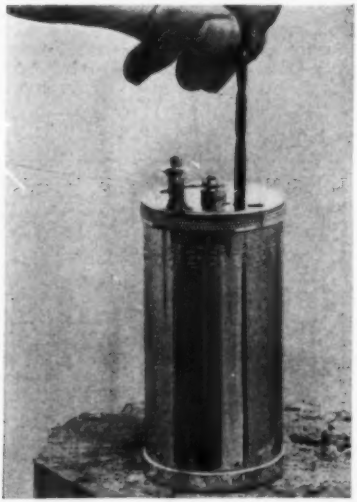
Ask for Catalog WG

the most complete catalog of its kind, illustrating hundreds of rotary files hand cut, milled cut, ground from the solid; also diesinkers' burs.

GROBET FILE CORP. OF AMERICA 3 Park Pl., New York, N.Y.

Handy Drill Holder

Time and trouble are saved by an ingenious new drill container. A cylindrical case, only 5" high and a bit over 2" in diameter, fit any tool box and hold drills Nos. 1 to 60. Each



drill, in a separate compartment, is made instantly available by turning knurled top to the correct drill number.

The container eliminates the usual time-wasting search through a box of drills, "mikeing" for correct size and loss of drills. It is made by Burbridge & Sons, Kenosha, Wisconsin.

TROYKE ROTARY TABLES

Moderately Priced

Made in 9", 12", 15", 18", 21", 25".
With or without dividing attachment.
Ask your dealer or write us for new 1941 8 page catalog.

ALFRED A. TROYKE
4422 Appleton St., Oakley, Cincinnati, Ohio

MAKE DUST GO with the TORNADO

Portable Industrial Vacuum Cleaner

Cleans floors, walls, pipes, line shafting, boiler tops, — everything in mill, shop or factory. Sucks up dust, dirt, grindings, chips, etc. Cuts waste and maintenance expense, reduces fire hazards, promotes health and morale.

1 H.P. GE motor gives ample power. 12 gal. dirt capacity. Weighs only 40 lbs. Attachments for cleaning everything. Power unit easily removable for blowing dust and dirt out of motors and machinery. *Write for details and FREE TRIAL OFFER.*

BREUER ELECTRIC MFG. CO.
5118 N. Ravenswood Ave., Chicago, Ill.

TAKE THE DUST OUT OF DUST IN with BREUER'S BALL BEARING TORNADO PORTABLE INDUSTRIAL VACUUM CLEANER

5000 SHAPES AND SIZES GROBET Swiss Files

Ask for Catalog WF.

The most complete catalog of its kind. Lists 5000 different shapes, sizes and cuts of GROBET Precision Swiss Files. Ask also for catalog WM on files for filing machines.

Learn more about these Chrome Steel Files that have won a reputation for utmost precision and durability.

GROBET FILE CORP. OF AMERICA 3 Park Pl., New York, N. Y.

SOLVED!

Your Welding Problem

We manufacture a complete line of ELECTRIC SPOT WELDERS from ¼ to 250 K. V. A. for welding:

- Brass
- Aluminum
- Bronze
- Stainless Steel
- Galvanized Sheets
- Monel
- Molybdenum
- Tantalum
- Nichrome
- Tin Plate
- Copper
- Nickel
- Silver
- Gold, etc.

There is an EISLER WELDER for every purpose.

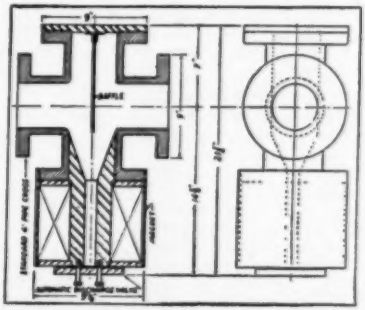
Butt Welders to weld from .010" to ½" dia. metal. We make all kinds of Standard & Special TRANSFORMERS. A. C. ARC WELDERS—100 to 400 Amps. SPECIAL SPOT WELDERS to Specifications. LARGE or SMALL QUANTITY CONTRACT SPOT WELDING.

WRITE FOR INFORMATION

CHAS. EISLER
EISLER ENGINEERING CO.
762 So. 13 St. near Avon Ave., Newark, N. J.

Eliminating Iron Particles

The illustartion shows a new type of Magnetic Separator which was originally designed for removing small particles of iron from circulating cutting compounds. It was built for a concern engaged in reaming rifle barrels, who found that minute specks of iron were causing scratches in the rifle barrels as well as causing reamers to break. The magnet is reported to have solved this problem.



The separator consist of a baffle installed in the pipe cross, as indicated, which deflects the flow of liquid to the poles of a high intensity electro magnet. A considerable portion of iron can be allowed to accumulate on the magnet polies before cleaning is necessary. Cleaning is easily accomplished by interrupting the current to the magnet. The magnet thus becomes de-energized and releases the accumulated iron, and the automatic discharge valve permits a flushing action through bottom of magnet which thoroughly cleans it. As soon as current is turned on, the discharge valve closes securely. A suitable rectifier supplies d.c. current.

Modifications of this design have been worked out for removing iron from other types of liquids by the Dings Magnetic Separator Co., 509 E. Smith St., Milwaukee, Wis.

BLUE BOOK
Announces a New Service

Available Plants Seeking Sub-Contract Work

THROUGHOUT the country, many plants engaged in defense production are in acute need of extra manufacturing capacity and are seeking subcontractors.

On the other hand, many plants with suitable manufacturing equipment available, are now anxious to assume sub-contract work.

The fact is that there is no oversupply of good machine tools, skilled men and production officials—and as Mr. Knudson has already said:—"Time is what we have to work with."

In a constructive effort to help expedite the defense program, we present an initial survey of plants that are equipped to handle sub-contract work, and are using these columns as a clearing-house for such information.

Sizeable screw machine and gear cutting facilities are available but due to current demands, these machines are not necessarily listed. If you have need of such equipment, please let us know the dimensions and volume required, and we shall gladly supply further information in that particular category.

Address all communications to Hitchcock Publishing Co., Defense Sub-Contract Dept., 508 S. Dearborn St., Chicago, Ill. Here is a list of plants and their facilities. Watch this section for additional plants next month.

FIRM: A A manufacturer of light portable business equipment. 600 shop employees; open shop. Wants more work as an excuse to materially expand floor space of plant. Seeks work upon which they can do a COMPLETE ASSEMBLY JOB. Have ample female help for such assembly work. 45 toolmakers; able to do a complete manufacturing operation. Do no casting or aluminum alloys but handle heat treated steels; also plastics work. Large assortment punch presses, drill presses, grinders, bench lathes, milling machines (13 of them), shapers, riveting hammers, arbor presses, plating and hardening and welding equipment. Associated with screw machine plant for that type of work, too. Not job shop.

FIRM: B A manufacturer of roasting equipment for display purposes. Can do medium heavy work. Good for heavy turning; ample grinders and fairly close tolerances. Big room for expansion. In last war made firing mechanisms for drop bombs with unusual record of having no rejections in inspections. Did 1000 bombs daily, precision work. Have made fabricated steel hospital tables. Enameling and finishing dept. Do lots of stainless steel work. Open shop. Have 4 punch presses, 2 hand screw machines, 12 lathes, 1 shaper, 2 milling machines, 24 drills, 13 grinders, sheet metal bending brakes, shears, air compressors, plating tanks, polishing lathes, spot welding equipment, etc.

FIRM: C A well known job machine shop. Also make specialty line of metal clamps, etc. Open shop. Can do reasonably close tolerances. Have full complement engine lathes, bench lathes, hand screw machines, shapers, drill presses, milling machines, arbor presses, boring mill, keyseater, etc. Also arc and acetylene welding. Total capacity is about 100 men—2 floors. Do lots of work on traffic signals for railroads, elevators, etc.

FIRM: D A typical machine shop set-up including milling machines, drill presses, shapers, lathes, shears, grinders, riveting hammers, spinners, filing machines, etc. Open shop. About 40 men to shift. Full assortment of tools. Have toolmakers on hand.

FIRM: H A large manufacturer of air pressure equipment. One of three leaders in its (industrial) field. Real precision work; close tolerances; large addition to plant just completed. Open shop. 14 screw machines, 20 jewelers lathes, etc.

FIRM: K A sizeable job shop with 35 to 40 men per shift. Open shop. This firm has been functioning for 15 years as high grade tool shop, job basis. Have 5 toolmakers, 8 hand screw machines (up to 3" capacity). 10 lathes of all kinds up to 20" throw. Specialize in aluminum and magnesium although can handle heat treated steel. Has made can machinery for non-sanitary cans. Designers of machinery. Have been doing aviation work for 2 years. US Army praises their fine work in which there are no rejections. .0005" tolerances. Making

some direct navy work. 9 engine lathes, 6 turret lathes, 6 milling machines, 14 drill presses, 3 grinders, 3 punch presses.

FIRM: M A tool and machine plant . . . die work, job shop. Have made dies for years for Westinghouse, A. B. Dick Co., Sangamo Electric Co. Have some brand new equipment. Considerable defense subcontract work now.

FIRM: N One of the best known firms in midwest. Seeks work which will include punch presses, if possible. Tool room tolerances: .000½ to .0003" in gauges. Open shop. Fine personnel. Versed in heat treated steels; aluminum. 10 lathes, 8 mills, 4 shapers, 14 grinders, 8 drill presses, 28 punch presses and a big variety of miscl. equipment and precision gauges.

FIRM: P Already very busy but needs even more volume to fill big new addition to present bldg. Doing lots aircraft work. Have 15 milling machines, boring mills, drill presses, grinder, jig borers, bench lathes (5) and 5 engine lathes, 5 surface grinders, 6 shapers. Vast variety of small tools; also complete heat treating equipment and 2 sets Johansson blocks and Carl Zeis instruments.

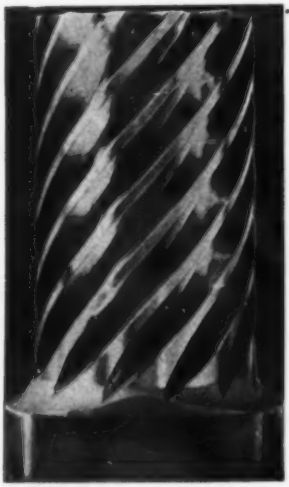
FIRM: Q This is one of best metal-working plants of its kind in the country. Now working 120 men in one-shift. Open shop. Tolerances of work: ± or — .002 Produced items during last war. Fine reputation; well rated. Products known throughout metal specialties field. 14 automatic and hand screw machines; 13 drill presses, 21 punch presses; fine, well-equipped tool room, assembly department (large); can do plating, painting, finishing, etc.

FIRM: W High grade medium and heavy job shop. Make line of industrial thermal equipment. Doing work for Navy, aircraft, arsenals, etc. Sizeable plant; open shop; one shift and overtime now, good technicians. 14 lathes, 5 milling machines, 10 drill presses, 3 boring mills, 7 grinders, 2 planers, 1 shaper, saws, shears, bending machines, punch presses, gauges and blocks.

FIRM: R One of the best of its type in country. Prominent in railroad, transportation and heavy equipment fields. Over 500 employees on one-shift. Open shop. Substantial rating. Make variety of metal products; now doing some primary defense work. A splendid set-up. Sizeable tool room facilities; production machinery includes 11 brake presses, 8 big shears, 4 large punch presses up to 600 tons, 27 other punch presses, 16 drill presses complete welding, paint spraying and oven equipment, etc. Even a cloth sewing dept.

FIRM: S An old established heavy machine shop. 70 years old. Makers of industrial heating equipment. Nationally known. Capable staff. Open shop. Sizeable space. Open for heavy metal work. Have boring mills (7), planers, slotters, keyseaters, 3 milling machines, 3 W&S turret lathes, grinders, 3 other heavy lathes, sizeable tool shop, big overhead cranes, blacksmith shop and pattern shop, etc.

FIRM: V A good all-round job punch press and tool shop. Accurate work. Now making stencil duplicating machines for others. Some real old-time metal-working men. Open shop.



A gear lapped in assembly with Timesaver Lapping Compound

PRECISE FITS—
IDEAL LUBRICATION—
QUIET OPERATION
with
TIMESAVER LAPPING COMPOUND

Especially prepared for the fitting and smoothing of gears and bearings in assembled units.

REDUCE COSTS—By eliminating hand scraping and running in operations.

EASY TO USE—Simply mix with oil and apply.

SAFE—Will not charge into metal surfaces or continue to cut.

TIME TESTED—Used by leading manufacturers for the past sixteen years.

Grades for ferrous and non-ferrous metals.

Ask for testing samples on your letterhead.

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COLMONOY FURNACE WELDING for HIGH PRODUCTION PARTS—

Such as Centerless Grinder Rests

This method consists of applying a casting of COLMONOY NO. 6 alloy to a steel base, by a furnace bonding process requiring no additional bonding material. One of the advantages of this process is its adaptability to high production parts, or intricate parts inaccessible for torch application.

COLMONOY NO. 6 is effecting substantial savings on machine tool parts subject to great wear and abrasion—lathe points, dogs, chip breakers, drill flutes, wire straightening shoes, thrust bearings, screw machine fingers, forming and drawing edges, etc.

COLMONOY may be cast or applied as an overlay, using gas or electric welding equipment.

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Hard Surfacing Alloys and Overlay Metals

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Sixth Floor, Buhl Bldg., Detroit, Mich.

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TEAM WORK

SUTTON Feed Fingers and Sutton DIAMOND-GRIP Collets work together to increase screw machine output and reduce spoilage. Catalog No. 14 lists all styles and sizes . . . ***Ask for a copy.***

Sutton Tool Company

2895 W. Grand Blvd., Detroit, Mich.

Accessories for Screw Machines

Drill presses, milling machines, lathes, shapers, hand screw machine, grinders, saws, bench presses, 16 punch presses; also tapping, welding, shearing, tumbling facilities.

FIRM: AB General machine shop founded 1906. Small but favorably known for doing tough jobs. Open shop. Does work for many large concerns—heavy work. Handles heat-treated steels; also brass and aluminum. Practical engine men. Developed many substantial products.

FIRM: AC A jobbing tool and die shop. Just moved into new bldg. of their own. Ample room for expansion. Small but efficient. Good tolerances. One shift. Have all necessary equipment for this type of work.

FIRM: AD One of the most desirable plants available in middlewest. Substantial company, nationally known in its field. One shift of 195 employees when running full; now 120 employees open the one shift. Open shop; fine labor supply for 3 shifts; tool and die shop holds to close tolerances. Photographs of plant on request; 31,104 sq. feet space. Capable of doing complete assembly job. Have plating, welding, facilities. This plant deserves special attention for its possibilities.

FIRM: AE This plant long known (40 years) for its light metal specialties. Did shell work in last war. Ample space and equipment for machining and assembling. Own their own bldg., 16,000 sq. ft. in suburban Chicago. 17 lathes, 4 hand screw machines, 2 turret lathes, 5 milling machines, 4 grinders, 7 drill presses, 10 punch presses; 2 shapers, 1 planer, 1 tapping machine, 2 automatic hobbing machines, etc. Painting and finishing department.

FIRM: AF This firm, long known in the heavy equipment field, has some machines available; doing heavy type defense work; about 100 shop employees in 2 shifts;- fine engineering staff; all heavy work. Machines available are Lucas Hor. Boring Machine (34"x40"; Betts #2 boring machine (hor.) 37x45); P&H Hor. Drilling, Tapping and Reaming Machine #1; Woodard & Powell Planer 36"x36"x12'; Gould & Eberhart 24" shaper, Putnam Heavy Duty double backgeared lathe; Peerless Metal Sawing Machine (brand new, hi-production model) and, finally, a 20'x20' Table Horizontal Boring, Drilling and Milling machine.

FIRM: AG This is one of the largest firms in agricultural implement field and this equipment (in sizeable quantities) is available in one of their plants:—8 bulldozers, 4 shears, 10 speed drills, 3 geared drills, 2 Bradley hammers, 5 rough grinders, 2 broaches, 4 Norton grinders, 8 engine lathes, 3 Sundstrand stub lathes, 2 Post radial drills, 3 #5 L&J presses, horizontal and straightline bores, etc., etc.

FIRM: AH This is internationally known company in agricultural equipment (tractor, etc.) field. Have big plant facilities and following machines are open for subcontract work:—4 Ingersoll milling machines, 1 Cincinnati centerless grinder, 1 internal grinder (Bryant), 2 G&E bevel gear roughing machines, 4 Fellows gear shapers, 1 Gear lapping machine, 2 B&S power hammers, 2 disc grinders, 4 Bullard vertical turret lathes, 4 Potter & Johnston chucking machines, 1 bolt cutter, 8 Williams & White bull dozers, 2 planers.

FIRM: AJ This is an old established plant and enjoys fine reputation in heavy machine field. Builds heavy presses. Large shop. Capable staff. These machines are open in spite of their heavy production schedule: 2 Norton grinders, 1 milling machine, 2 drill presses, 3 planers, 1 shaper, 8 large lathes (one being 25' bet. centers), 2 horiz. boring mills, 2 P&H drilling machines.

FIRM: AK This firm is sizeable; has national coverage in elevating and conveying equipment, crushing and grinding machines. Have 8 ton daily grey iron foundry. Ten engine lathes, 8 turret lathes, 9 drill presses, 4 gear cutters, 3 milling machines, 3 boring mills, 5 grinders, 5 planers, etc.

FIRM: AL These people are pioneer flour mill machinery builders. Known nationally for nearly century. Have 2 boring mills, 2 planers, 3 radial drills, 3 milling machines, 3 grinders, 8 lathes and large assortment of misc. equipment incl. power hammers, punch presses, shapers, etc.

FIRM: AM Fine, long-established plant. Open shop. 6 acres ground; 250 shop employees in pattern, foundry, machine shop, etc. Plant 1 block long, 2 blocks wide. Builds industrial machinery for pulp and paper trade; also power dam gates. 7 hoists, unit heaters, power forging hammers, etc. Complete assortment of all machines including large grey iron foundry.

FIRM: AO This firm has long been a leader in flour, feed, cereal mill and grain elevator machinery; also power transmission, elevating and conveying equipment. Splendid national reputation. Large plant and complete machine facilities includ. gear cutters, milling machines, boring mills, etc.

FIRM: AR Well known in ornamental iron work. Have large foundry for ferrous and non-ferrous work. 1000 employees; total working space 150,000 sq. feet. Rated in Duns A-1. Did important work in last war. Normal products are architectural metal work, misc. steel work, cast iron, aluminum, bronze, nickel silver, etc. Fabricated metals. Total annual production up to 2½ million dollars. A very sizeable machine shop on production basis including 9 lathes, 9 milling machines, 18 saws, 34 grinders, 53 drill presses, 14 punch presses, etc., etc. In middle west.

LESLIE HAND PUNCH PRESS

MOST CAPACITY

POSITIVE ALIGNMENT

Max. cap. 2⅝ dia. hole thru 10 ga. iron, proper shear on punch, throat depth 6". Takes punch press dies up to 3⅝x4½ in area.

Leaf arm gives perfect alignment without ways or leader pins. Portable. Price $75.00

F. O. B. Chicago. *Ask your dealer, or write for circular.*

LESLIE WELDING CO.

2947 Carroll Ave. Chicago

Priorities on Steel

Steel in all forms, including alloy steel, was placed under full priority control recently. With this action, all iron and steel products are under priority control, so that defense needs can be put uncompromisingly ahead of non-defense needs. While alloy steels are included under the present order, a separate order is to be issued shortly, giving details of the regulations applying to alloys.

Made necessary by a growing shortage in certain types of steel products, the step taken is one of a series of moves which the Priorities Division has made since the first of the year to make sure that iron and steel products flow promptly to defense channels.

Previously iron and steel products had been placed on the Priorities Critical List (giving Army-Navy orders priority), have been subject to inventory control, and have also been subject to the terms of the General Steel Preference Delivery Order No. 1, designed to expedite delivery of defense steel. An order putting pig iron under full control was issued four days previously.

A basic provision of the new steel order is that all defense orders must be filled ahead of non-defense orders. Some of the other basic provisions are:

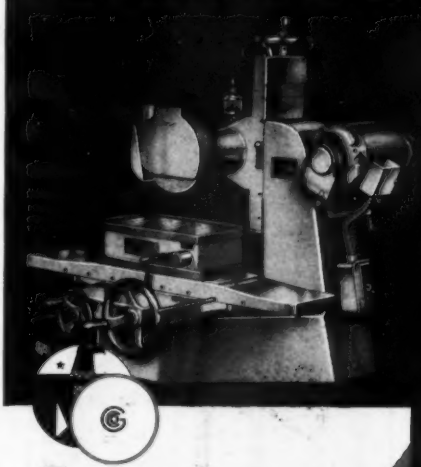
1. A producer must file monthly reports with the Division of Priorities.

2. The order contains provisions designed to prevent the building up of excess inventories.

3. Purchase orders for steel must be accompanied by a special form (PD-73) obtainable from steel producing companies setting forth the purposes for which the ordered material will be used.

Full details may be obtained in General Preference Order M-21, available from Iron and Steel Branch, Office of Production Management, Washington, D. C.

TO-morrow



TOMORROW you must make deliveries! Delivery dates are becoming increasingly hard to meet and every tool in your plant must be kept keen to maintain peak production.

CARBIDE tools have been a tremendous factor in the Defense Program, but high efficiency in carbide tools is dependent upon grinding. The GRENBY S-1 Surface Grinder is used extensively for carbide tool grinding. For this work it has no equal.

These features combine to give a perfect grind on carbides.

. . . smooth cable feed, no chatter
. . . spring loaded counterbalanced spindle
. . . precision spindle accurate to .0001
. . . simplified set-up
. . . optional accessories

THE GRENBY line also includes Internal, External, Flute and Cutter Grinders.

Send for the Grenby Catalog

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ARMOR MILLING MACHINE

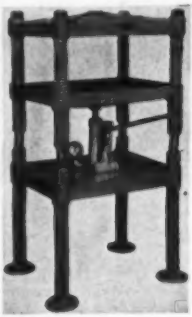
Hydraulic or Hand feed at the turn of the wrist

Vertical and Horizontal spindles. A standard machine equipped with drives to produce slow or high speed milling. Table feeds up to eight feet per minute.

Write for Bulletin J9.

Aircraft Machinery Corp.

Burbank, California



PACIFIC 24"x30" HYDRAULIC PRESS

30 ton capacity

Suitable for forming of light gauge metal. Also for spotting in of dies.

Write for literature and prices on this size press; also on our other sizes for various applications.

Pacific Hydraulic Press & Tool Co.

P. O. Box 87, Huntington Park Station
LOS ANGELES, CALIFORNIA

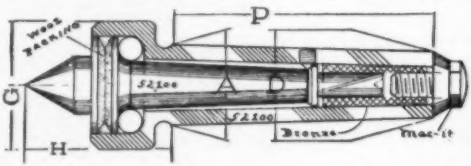
Connecticut Trains Defense Workers

A state-developed state-financed plan of emergency training of defense workers is apparently leading the nation in combined effectiveness and quantity of worker training, according to Otto W. Winter, National Chairman, Emergency Defense Training Committee, A. S. T. E.

Under the remarkably smooth running Connecticut system, 29 schools are now cooperating to turn out 3,000 workers every five weeks, trained for specific jobs in specific plants. The effectiveness of the training work—developed thru cooperation with industry—is indicated by the example that 45 per cent of all machine operators at United Aircraft, key national defense plant, have come out of the 200-hour schools typifying the "Connecticut plan."

This plan is quite similar to the training program recommended by the A. S. T. E. last year and experience gained through operation of the Connecticut plan had considerable influence on the formulation of the training program.

Peculiarly enough, when the Conneticut plan was first put in operation some two years ago, little or no response could be obtained in Washington looking toward extension of the plan on a national scale, according to the 'creators' of the training plan in Connecticut.



No. 52100 Steel, Gold Seal Balls, Mirror-Finish bearings, Mac-it Screws, Integral Ball-Races, Gracefully tapering Spindle, Bronze Bushing, Minimum Parts, Repeat Orders & 100% Collections, are the characteristics that go with the Rigid Live Centers.

RIGID TOOL CO., **2900 Witherell St., Detroit, Michigan**

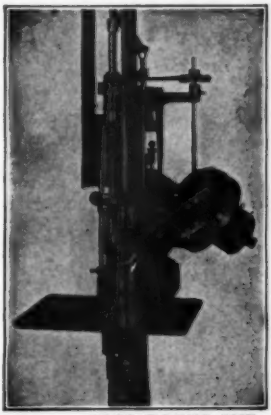
USE DETROIT POWER SCREWDRIVERS

FOR PRODUCTION ECONOMY

THESE MODERN MAGAZINE-FEED POWER SCREWDRIVERS ARE USED BY HUNDREDS OF MANUFACTURERS.

NO JOB TOO TOUGH.

SEND SAMPLE ASSEMBLIES FOR PRODUCTION ESTIMATES.



DETROIT POWER SCREWDRIVER CO.

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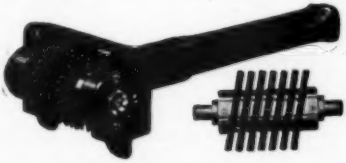
GRINDING WHEEL DRESSERS—VISES

We manufacture the only complete line of Grinding Wheel Dressers and cutters and will gladly suggest the proper one for your wheels.



Desmond Heavy-Duty Dresser

The exclusive solid steel slide makes Simplex Vises stronger and more serviceable.

Simplex Machinists' Vise

Desmond Diamo-Carbo Dresser, best tool room dresser.

Write for catalog H showing complete line of Desmond Dressers and Simplex Vises and name of your nearest dealer.

DESMOND-STEPHAN MFG. CO., URBANA, OHIO

Canadian Desmond-Stephan Mfg. Co., Ltd.—Hamilton, Ont.

LITTELL Pres-Vac SAFETY FEEDER

KEEPS HANDS OUT OF DANGER ZONE

PRESSING trigger creates strong vacuum in cup for holding flat-surface materials for feeding to press. Releasing trigger releases piece held. Keeps hands out of danger zone. Single and double-cup types.

ASK FOR BULLETIN 9-C.

F. J. LITTELL MACHINE CO.
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MOREY VERTICAL SHAPERS

8" Stroke
12" Stroke

Accurate — simple for toolroom manufacturing. Self-contained motor drive.

Ask for Circular No. 726

Morey Machinery Co., Inc.
410 Broome Street, New York, N. Y.

Miller Industrial Welders

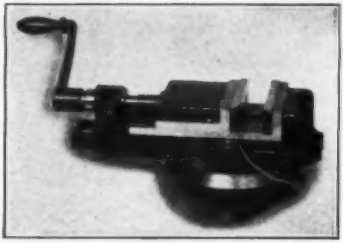
Four models for production work on manual or automatic welding are available in a new line of transformer type welders with built-in power factor correction. It emphasized that they are designed to reduce current consumption, which will conserve power supply under the Defense Program. Because of the decreased K. V. A., smaller wire, switches, cable, and fuses can be used, resulting in considerable saving in installation costs and also reducing demand charges, it is claimed, by approximately one-third.

These units answer a twofold purpose. When not in use as arc welders, they can be used to correct power factor of existing installations.

Built to conform to N. E. M. A. standards, these welders employ Class B insulation, i. e., asbestos and fiberglas, and feature two open circuit voltages—80 and 100. Thus, the operator is enabled to choose the correct voltage for the work, for maximum arc flexibility and lowest power costs. The higher voltage is an advantage when welding with alloy electrodes, giving a smoother, more stable arc, and the lower voltage is sufficient on general work.

The amperages, shown by indicator on front of cabinet, may be adjusted

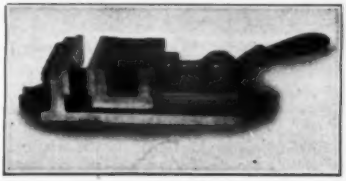
The Modern Swivel Vise



Base graduated in degrees
Alloy steel hardened screw
Hardened & ground jaws
Made in several sizes
Weight 36 pounds

List Price $40.00

The Modern Quick Acting Cam Vise



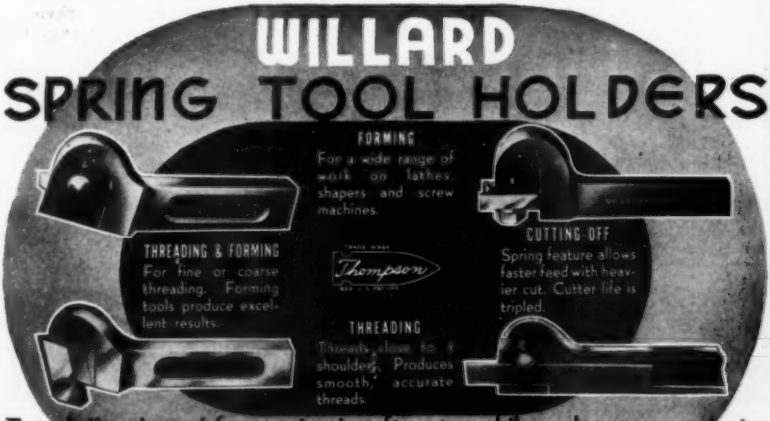
All steel parts hardened
Hardened alloy steel screw & handle
Hardened & ground jaws
Semi Steel castings thruout
Made in two sizes
Weight 20 pounds

List Price $35.00

Manufacturer of high speed steel and carbide cutting tools.

MODERN TOOLS, E. Berlin Conn.

WILLARD
SPRING TOOL HOLDERS


FORMING
For a wide range of work on lathes, shapers and screw machines.
THREADING & FORMING
For fine or coarse threading. Forming tools produce excellent results.
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Spring feature allows faster feed with heavier cut. Cutter life is tripled.
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Threads close to a shoulder. Produces smooth, accurate threads.

Especially adapted for use in aircraft, automobile and accessory plants.
No Chatter or Tearing. No Breaking of Cutters. No Damaged Work. Write for Details.

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wheels, and the speed of travel are asserted to clean particles of material from the belt automatically.

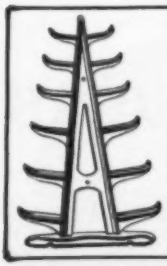
Leading the band through holes in the work and in front of the two idler pulleys permits sanding inside edges of almost any shape.

Base is 6"x12" and the machine is just about the right height for the average bench. It is designed to operate at approximately 1750 r.p.m. with motors of 1/6 to ¼ h.p. capacity. Step pulleys may be used if necessary to alter the speed. The table tilts from the normal horizontal position to 45° angle in relation to the band, permitting a wide range of beveling. Throat distance from front band to supporting pedestal is 8½" deep, permitting work to the center of pieces up to 17" in width. Bands of any width up to 1" may be used, and can be changed quickly. Bands are inexpensive so a range of widths and grits can be carried on hand.

The standard removable backstop which projects through table, directly behind the front part of the band, is a flat piece of steel 1" wide. Backstops of different widths and shapes may be substituted quickly.

Table top is a sheet of hard-faced tempered "Presdwood Masonite" which will not rust or become sticky in damp Summer weather. It may be replaced at trifling cost.

Address Mead Specialties Co., Dept. 2, 15 So. Market St., Chicago, Ill., for further details.



"CHAMPION"
Steel Racks

Save time, steps and money by keeping bar stock, shafting and pipe out of the way and off the floor.

Write for full details.

The Western Tool & Mfg. Co.
Springfield, Ohio

for your lathes
SENECA FALLS
Automatic
WORK DRIVER

Self Centering . . . Quick Acting . . . No Slip. Attaches to any chuck plate or spindle. Provides a slip-proof, balanced drive reducing chatter. Handles rough forgings or turned pieces—straight or taper. Eliminates dogging time. Reduces tool breakage. Write for details and size range.

SENECA FALLS MACHINE CO., 314 Falls St., Seneca Falls, N. Y.

EVANS *High Speed Steel* **REAMERS**

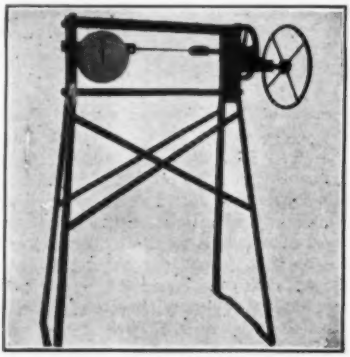
LOOK AT THESE FEATURES

- No honing.
- Will not chatter.
- Chrome-like finish.
- Perfect alignment.
- Full bearing surface.
- Left and right spirals.
- 50 to 80 thousandths expansion.
- Cannot fall in slots or oil grooves.
- Extension pilots for line-up work.

WILL SHIP ON 30 DAY'S TRIAL | **EVANS FLEXIBLE REAMER CO.** Ravenswood & Wilson Ave., Chicago, Ill. | WRITE FOR CIRCULAR

Simple Tensile Testing Machine

A simple and low cost machine for tensile tests of all kinds of material



has been developed by W. C. Dillon & Co., Inc., 5410 W. Harrison St., Chicago. It will test the tensile strength of rods, tubing, wire, flat metal forms, castings, welds, chain, etc., up to 25,000 pounds. Load remains stationary at any point when operator's hand is removed from the tension wheel. If required, the machine can be constructed to take materials of greater length than shown in the illustration.

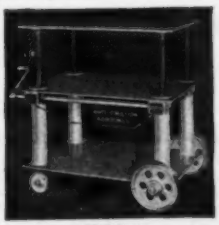
The utility of such a machine is obvious. It can be operated by anybody and there are no delicate parts to get out of order. Several testing machines can be installed in strategic parts of large plants, and tests can be made whenever required, maintaining product quality and increasing shop efficiency. Periodic or constant checks can be made on materials purchased.

The machine employs the Dillon Dynamometer which can be dismounted for hoist, drawbar and weighing uses.

Turret Lathe Tool Catalog

The complete line of Turret Lathe Tools for ram and saddle type turret lathes is covered in a new 168 page loose-leaf catalog.

It covers 164 tools (many of them



STYLE A

The **HAMILTON PORTABLE ELEVATING TABLE—"PORTELVATOR"**

No strained backs or bruised fingers if you let the Hamilton "Portelvator" do the lifting for you.
Use it as means of support—Use it to level large overhanging pieces of work—Use it as a bench to work on—An economical and efficient helper—One to twenty ton hand or power operated.

Write for full details today.

THE HAMILTON TOOL COMPANY
Ninth and Hanover Streets, HAMILTON, OHIO

WIREGRIP Belt Hooks —6 sizes of tough hooks conveniently carded. No waste. Makes smooth humpless flexible joint on all flat belts.

STEELGRIP Lacing — 8 sizes, applied with a hammer. For all flat belts on tough drives. Prevents end fraying.

Here at one source are all belt lacing needs, dependable satisfactory products of guaranteed material and workmanship. *Write for Catalog.*

ARMSTRONG-BRAY & CO.
"The Belt Lacing People"
5364 Northwest Highway,
Chicago, U. S. A.

Tapping As Fast As You Can Drill . .

with the A. M. Sensitive Tapping Machine . . . from the smallest and finest up to 7/16" diameter in steel and iron—and up to 1/4" in softer materials. A modern unit that within its capacity, will take all the punishment intense production can inflict.

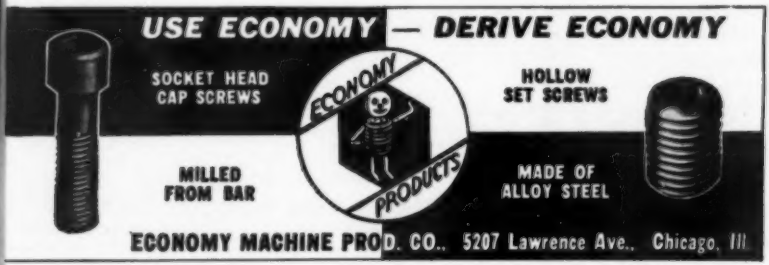
Write TODAY for this sure solution of your small tapping problems.

A. MUEHLMATT DIVISION
OF
THE HAMILTON TOOL CO.
Ninth and Hanover Streets,
HAMILTON, OHIO

not previously announced) built in more than 500 sizes, which are illustrated in three colors. Short easy-to-read descriptions of each are given. Nearly 500 illustartions picture each tool, its application and its principal dimensions. Dimension drawings are large enough to permit direct scaling to layout sheets and the individual (8½"x11") pages may be removed for reference.

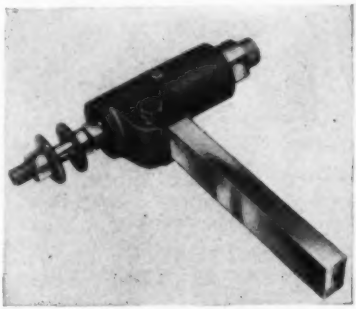
Such unique features as completely-pictured suggested standard sets of tools for a specific size of machine and type of work, a cross-referenced 10-page index of all tools, and a separate section devoted to attachments which may be added to present turret lathes, make the catalog particularly valuable to turret lathe users in the present defense emergency.

Copies will be supplied only to those who write direct to the Gisholt Machine Co., 1185 East Washington Ave., Madison, Wis. Turret lathe users can obtain catalogs at no cost by writing on company letterhead listing make and model of machine used and the writer's title or occupation. All others, including students and teachers, may have copies by accompanying their requests with a remittance of $2.50 to defray cost of printing and mailing. Although no credit sales can be accepted, a 10 day inspection period is granted, after which book may be returned and the publisher will refund purchase price in full.



Stow Tool Post Attachment

A new tool post attachment for lathes, driven by a Stow portable flexible shaft machine, is being produced by Stow Mfg. Co., Inc., Binghamton, N. Y.



By this means a lathe may be adapted to many different grinding operations, both external and internal. The device accommodates grinding wheels as large as 6" diameter x 1" face. By taking off the clamp spindle and substituting the Stow Collet Chuck, a variety of mounted wheels and points may be operated for internal grinding and recess surfacing.

On the tool end, the Tool Post attachment is fitted with a combination radial thrust and annular ball bearing, and on the shaft end, a floating, self-aligning ball bearing is used. This rigid spindle support insures true running of the unit at speeds as high as 6800 r.p.m.

Knu-Vise Offers New Catalog

Knu-Vise Toggle Action Clamping Fixtures are the subject of a 24-page catalog just released by Knu-Vise, Inc., 16841 Hamilton Ave., Detroit.

It features 22 different models of clamps, pliers, plier-parallels, "C" clamps, riveters and drill fixtures.

BLUE PRINT CABINETS

•

EASY ACCESS.....
POSITIVE PROTECTION
for your
Valuable Drawings and Tracings

•

THREE STYLES—
Available in Five-Drawer, Three-Drawer, and One-Drawer Units with dimensions 38" x 26", 44" x 32" and 50" x 38". These drawers may be sub-divided into smaller compartments. Furnished with either plain closed base or leg base.

CONSTRUCTION—
Sectional type. Drawers operate easily on roller channel suspension, gravity stops, lift compressors, and rear hoods. Solid bronze label holders and drawer pulls. Finish olive green.

THE INTERIOR STEEL EQUIPMENT CO.
2352 EAST 69th STREET, CLEVELAND, OHIO
SHELVING • LOCKERS • CABINETS • FILES • DESKS

PROMPT DELIVERY

DYER

Heavy Duty Spot Welders

Dyer Welders are available in a wide range of sizes and capacities—air or foot operated, giving maximum production—simplicity of operation—power economy.

Floor models 10 to 35 KVA.

6 point selective switch on all floor models allows for quality welds on various materials. Standard and Underwriters Labeled Machines.

3 point switch on bench models.

Bench models 2½ to 10 KVA.—with or without pedestal.

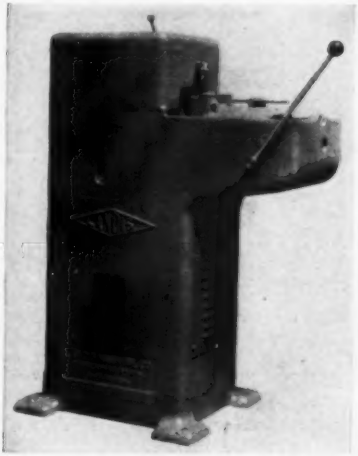
Few Territories Available.

The Topeka Foundry & Iron Works Co.

300-332 Jackson St., Topeka, Kansas

⅜" Threading Machine

Landis Machine Co. announces a new high speed hand operated threading machine for quick and economical production of precision threads in the Automotive and Aircraft industries.



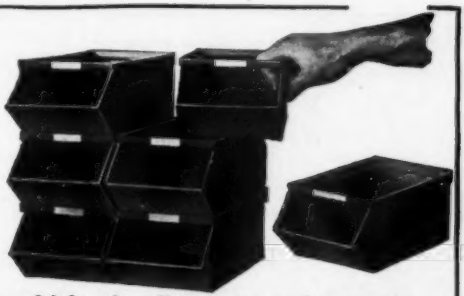
The operations incident to threading all types of screws, studs, rods, etc., are controlled by one lever. The grips are opened at extreme end of return stroke of operating lever and are automatically closed during first portion of forward stroke. Advance of carriage is then controlled by continuation of the forward stroke until end of the thread is reached, when die head is automatically tripped open.

The gripper unit is a spring loaded toggle mechanism completely housed in carriage. Interchangeable grips are used to hold diameters of work within capacity range of machine. Means are provided for centralizing grips with center of spindle and die head. Design of gripper units permits loading work from top grip. Thus carriage travel can be held to a minimum for any combination of length of thread and length of work.

Spindle is mounted on precision preloaded ball bearings fully protected

PARTS

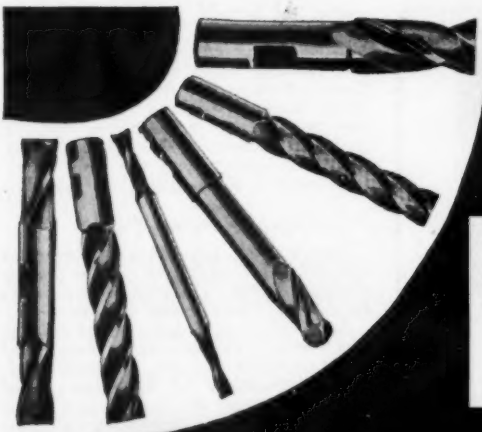
where you want them— when you want them



You'll save time, space and labor handling parts and materials when you use these patented STACKBINS. STACKBINS keep parts instantly accessible—eliminate waste hand motions—stack compactly to form units of exactly the right shape and capacity—make order filling or assembly work faster, easier, more efficient.

STACKBINS
"STACKED AND STILL ACCESSIBLE"

Write today for full story on patented STACKBINS, and learn new lessons in efficiency. Stackbin Corp., 55 Troy St., Providence, R. I.



Shear Cut— High Speed

END MILLS

Shear Cut End Mills are offered in all standard sizes, single and double end.

Write for catalog and prices today.

PROGRESSIVE TOOL & CUTTER CO.
2345 WOLCOTT ST., FERNDALE, MICHIGAN

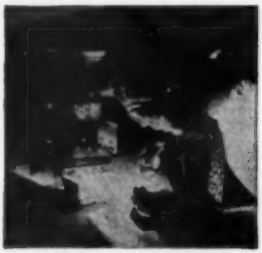
Many American Metal workers have learned that this lubricant greatly lengthens the life of their taps and other cutting tools in operations on hard steels. Its pigments tend to reduce friction—its heat absorbent properties keep the tools and parts cooler.

The long list of successful metal workers who use this lubricant is the best proof of its efficiency.

Write us for further information and/or samples.

Wayne
CHEMICAL PRODUCTS CO.
9446 COPELAND AVE. DETROIT, MICHIGAN

MAGIC Electro Welder



WELD IT YOURSELF

This handy, moderate size, useful welder, which sells for $35.00 is designed to handle odd small jobs that would otherwise tie up large expensive welders. Several located in your plant will save trips to the welding department. Easy To Use.

Will weld, braze or solder. Can be used for small butt, lap, or fillet welding. Welds fractures in cast iron; fills cracks and pits in bronze and aluminum castings and builds up bearings, gears, worn shafts, etc. Plugs into any 110 volt a. c. outlet. Guaranteed for one year.

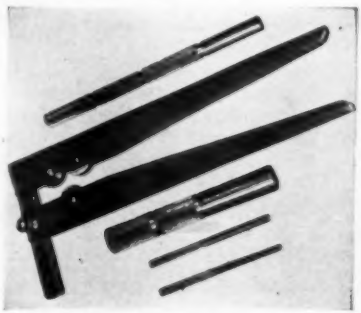
Write for details.

Magic Electro Welder Mfg. Co.
239-241 CANAL ST., NEW YORK, N. Y.

and sealed against coolant and grit. Drive to spindle is through a single V-belt operating on sheaves having four steps, providing speeds of 270, 338, 520, and 845 r.p.m.

A Knurling Tool

A new type of knurling tool known as "The Handy Knurler" has been developed by the Pacific Specialty Supply Co., Los Angeles, Cal.



The tool is held in the hand like a pair of pliers and uses 3 knurls. Its construction permits knurling diameters from as small as 5/16" up to 2". It can be used on work held in a lathe chuck as well as in a drill press or even a vise. It saves times because all that is necessary is to bring the knurls in contact with the work to be knurled and to compress the handles.

Spot Welding Timers

Ignitron spot welding timers to control welding of aluminum, heat treated alloys, and other materials are described in a new Westinghouse leaflet.

Application, distinctive features, and construction are discussed. Tubes and other important parts are described. Operating details list the functions of tubes and relays and explain how stepless welding is accomplished. Outline sketches give physical dimensions and show position of conduit connections.

A copy of descriptive data 18-335 may be obtained from department 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

LATHE STOP $15.00

PRICES GO DOWN ON QUADRUPLEXES

The Quadruplex Lathe Stop and Turret Tailstock help ease the production load by their multiple operations. Low cost, universal adaptibility and ease of attachment make QUADRUPLEXES a "MUST" on all lathes.

F.O.B. BLOOMFIELD, N. J.
IMMEDIATE DELIVERY FROM STOCK

TURRET TAILSTOCK $15.00

Dept. B 1 SPECIALTIES MANUFACTURING COMPANY INC.
35 FARRAND STREET, BLOOMFIELD, N. J.

"Airgrip" Air Cylinder

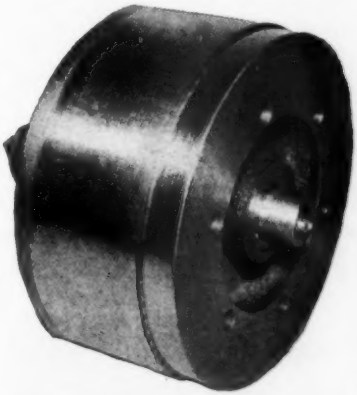
Airgrip Chuck Div., Anker-Holth Mfg. Co., Port Huron, Mich., offers an improved "Model D Airgrip" ball bearing revolving air cylinder, suitable for use with chucks, fixtures, jigs and other machine tools.

Wear is automatically taken up by the air pressure within the cylinder so that no manual adjustment of packing is required. For long life, the graphite treated piston packing incorporates a copper wire in each strand.

It is explained that air pressure on the airshaft packings in each air inlet is balanced. Consequently there is no end thrust and the entire air connection may be revolved freely around the airshaft, with full pressure in cylinder.

Air inlet body has a long bearing on airshaft, of small diameter, and ball bearings on both ends. This reduces friction to a minimum and allows higher speeds.

The cylinder, which is approved by the American Standards Assn., is made in standard sizes from 3" to 20" diameter, and both a semifinished adapter and "Airgrip" operating valve are furnished.



The company also makes revolving cylinders with hole through center, for feeding barstock through the spindle of the machine, and a complete line of

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BUTTS AND CONTINUOUS LENGTHS — *for* GUARDS — CABINETS — CASES — BOXES — LUGGAGE
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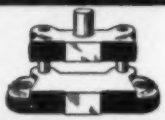
HARDWARE DIVISION
4539 WEST LAKE STREET CHICAGO, ILLINOIS

BAUMBACH



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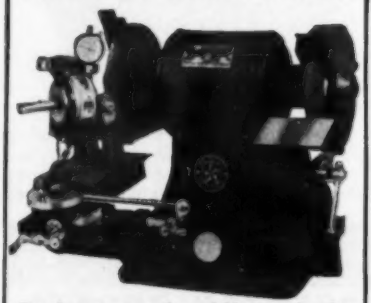
Machined Steel DIE SETS Semi-Steel
Drop Forged Steel

Headquarters for Standardized Die Sets, embodying many exclusive features and embracing more than 195,000 stock sizes and 46 different styles. A die service that is unsurpassed. Let us prove it!

Send for our new 336 Page Catalog.

E. A. BAUMBACH MFG. CO.
1810 So. Kilbourne Ave., CHICAGO, ILL.

Precision Drill Grinder



Simple to operate—dependable—speedy—this Precision Grinder will enable you to produce perfect points on standard twist drills in sizes from No. 41 (.096) to 3/8" (.625).

Send today for more details.

Star Machine & Engineering Corp.
Division Star Electric Motor Co.
Bloomfield, - - - New Jersey

stationary cylinders of various types, as well as jaw and collet chucks, expanding mandrels, expanding arbors, control valves, etc.

"100 Years of Bowling"

An attractive and interesting 28-page brochure, issued by B. M. Root Co., York, Pa., presents the history of the popular sport of bowling. Written by J. Wm. Stair, the story reviews the development of this popular pastime from about 50 B.C. to the present. The text is written in a light, popular vein and considerable information about the sport is presented. Illustrations of two popular Root boring machines are included.

Rust and Scale Removal

With equipment now operating at full capacity in plants the Nation over, maintenance routines must also be handled on a faster, more effective basis.

Of timely interest to metal producing and fabricating plants, is the revised third edition of an illustrated 20-page booklet by Oakite Products, Inc., 57 Thames St., New York, describing improved, safe methods for quickly removing water scales, rust and similar deposits from over 29 different types of water-cooled or water-circulating processing and other equipment.

Concise data are given on Oakite Compound No. 32, a specially designed material which because of its high scale and rust removal properties and wide range of activity, helps eliminate the need of time - consuming mechanical methods for de-scaling equipment. Among the units discussed are surface and evaporative condensers; Diesel, gas and gasoline engine cooling systems; "lube" oil and jacket water coolers, feed water heaters and similar heat exchangers; condensers of the shell-and-tube, double-pipe and vertical-open types; water-cooled air or gas compressors.

In addition, the booklet includes much helpful information on various types of work where safe, fast, effective removal of scale or rust is essential in connection with equipment operation or for appearance.

Spotfacing and Boring

New methods of spotfacing and boring are said to be brought to industry through introduction of a new product manufactured by the Bokum Tool Co., Detroit, Mich.

This B & B Spotfacer and Boring Tool, as it is called, performs a wide variety of operations and claims the elimination of many extra tools usually required to do certain jobs. More accurate work can be produced with fewer motions in much less time, it is claimed, and heavier cuts can be made in shorter time.

The tool consists of a head (or bar) with a cutting blade running through a slot at the end of it at right angles. Located on the head is a dial, and micrometer readings enable the operator to set and lock the blade securely to precise diameter measurements within ten-thousandths of an inch.

The tool is made in three models with standard blades providing a range of boring diameters up to 22". A wide range of spot-facing is also offered.

Work Wanted

A NATIONALLY KNOWN MANUFACTURER OF PRECISION MACHINERY HAS FACILITIES FOR TAKING ON ADDITIONAL WORK for: W. & S. Turret Lathes, Boring Mills, Lathes, Punch Presses, Screw Machines, Precision Cylindrical and Internal Grinding, also Sub or Full Assembly Work.

BOX 142

c/o **Hitchcock Publishing Co.**

508 S. Dearborn St., Chicago, Ill.

BURKE
MILLING MACHINES
Make Fast Work of Small Jobs

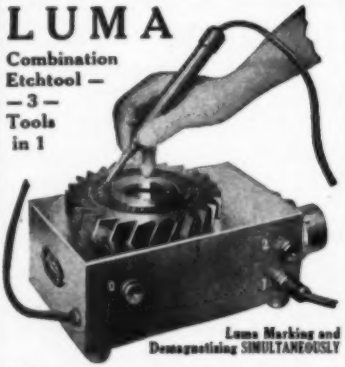
Motor Driven

Timken roller or ball bearings to spindle

Write today for circulars.

Burke Machine Tool Co.
297 E. 16th St., Conneaut, Ohio

LUMA
Combination Etchtool — —3— Tools in 1



Luma Marking and Demagnetizing SIMULTANEOUSLY

Writes on hardened steel — demagnetizes at the same time—with carbon point does light spot annealing and soldering jobs. Compact—easy to use—dependable.

Send for details—5-day FREE TRIAL OFFER!

Luma Electric Equipment Co.
Dept. H—Main P. O. Box 132, Toledo, Ohio

With the aid of a standard small tool adapter, the same tool can be used to bore holes as small as a ¼" in diameter.

By using blades with step formation, many different diameters may be bored; and steps, or shoulders, may be faced at the same time.

The Spotfacer will bore to exact diameters and face bottoms square and flat.

In addition to conventional boring, this new tool shows many advantages in boring long holes in either forward or inverted direction. Instead of building special length bars for tail stock support, a worker can now employ another adaptation of the same tool for this work—the B & B Line Borer. This tool, however, has a tapered shank at both ends. In use, one end is placed in the spindle in the conventional manner and the other end, forming the support, is placed in the tapered end of a plain shaft. This latter may extend beyond the work to reach any bearing support. The tool also permits the bar itself to provide the front pilot. Thus no makeshift or special equipment is required for long boring, and a saving of time and money is achieved.

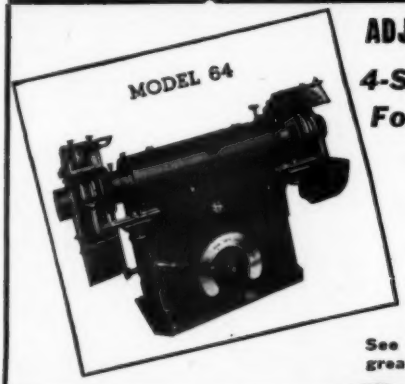
Flexible Shaft Machine Brochure

A new 8-page brochure describing completely the various flexible shaft machines available for defense industries has been issued by Walker-Turner.

Equipment for use in grinding, polishing, burring and for a host of other operations necessary in the manufacture of airplanes, airplane engines and parts, marine engines and accessories, in the automotive field, in general machine shops, foundries and die shops are described in detail.

Machines illustrated range from heavy duty models to commercial and intermittent duty types, and include bench and floor models, and suspended models in direct drive, multi-speed drive and two-speed geared drive.

A copy of this brochure, Bulletin FS-41 may be had from Walker-Turner Co., Inc., 1751 Berckman St., Plainfield, N. J.



ADJUSTABLE SPEED GRINDER

4-Speeds
For Any Change Of Pace

Efficient Peripheral Speed Down To The Very Flanges

saves time and costs

See catalog for details about America's greatest line of electrical tools.

THE UNITED STATES ELECTRICAL TOOL CO.

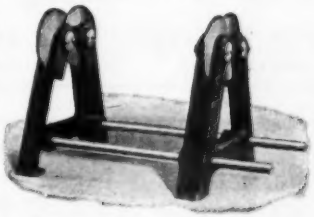
THE GOOD MECHANIC'S CHOICE

CINCINNATI, OHIO, U.S.A.

trying to operate our shop without ***ANDERSON BALANCING WAYS***

All shops handling rotating parts can profit by using this simple, sturdy and thoroughly dependable device for balancing, straightening and truing operations. It assures better work in less time and with less labor.

Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



Four chilled iron discs rotate with minimum friction on sensitive special bearings, giving a quick, accurate indication of whether or not the work is in perfect balance.

ANDERSON BROS. MFG. CO., 1907 KISHWAUKEE ST., ROCKFORD, ILL.

G. E. Balancing Machine

A portable dynamic balancing machine designed and recently introduced by the General Electric Co., is claimed to make correction of unbalance of turbines, generators, or both rotating elements simpler, faster, and more complete than methods formerly used.

The balancing equipment consists of three principal parts:—a sine-wave alternator, a vibration velocity unit, and an indicating unit and its associated

circuits, all fitted in a handy carrying case. It may be used during initial manufacture or installation of a rotor; after subsequent servicing; or to correct unbalance caused by pitting or corrosion. Rotors may be checked with the device while running in their own or in substitute bearings.

Rotors that are too heavy for any available balancing machine can be balanced with the new equipment. By permitting accurate balancing under operating conditions in the rotor's own bearings, it eliminates the need for shipment of the rotor to a balancing machine, thereby lowering balancing time and costs. Further, the quality of the results is improved since balancing under operating conditions corrects for changes such as those due to

YOUR FIRST LINE OF
DEFENSE against
HIGH SHARPENING COSTS

No. 57T
Automatically Sharpens Metal Saws in gangs up to 8" in diameter. Takes gangs up to 3½" thick. The saws are automatically indexed and sharpened within variation of plus or minus .001 of exact diameter of entire lot.

Write for Folder 57T.

THE WARDWELL MFG. CO.
3165 Fulton Rd. Cleveland, Ohio

FOR DEFENSE
KARELSEN'S DIAMONDS KEEP THE WHEELS OF INDUSTRY TRUE
DIAMOND POINTED EMERY WHEEL DRESSERS
¼ KT. TO 10 KT.
IMMEDIATE SHIPMENT
Send for Prices *Specify Holder*
"If its made of Diamond—Ask us First."
E. KARELSEN, INC. *Established 1852* 56 W. 45th St., New York, N. Y. Tel. VAN. 6-5688

A CLAMP for Every Purpose

Forged Steel
Quick Acting
Deep Reach
Welders

Sizes Available:
¾" to 10' opening
½" to 16" deep

Write for CATALOG and PRICES on Clamps for all purposes as well as many other tools for use in the Machine Shop.

IN STOCK AT YOUR SUPPLY HOUSE

The Cincinnati Tool Co., 1945 WAVERLY AVE., CINCINNATI, OHIO

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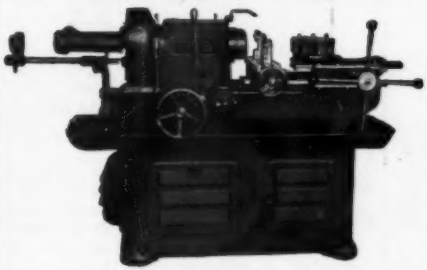


No. 2G & No. 3 Turret Lathes

Motor Drive
Infinite Spindle Speeds

Any spindle speed you want—a direct reading dial shows when you've got it.

Permits the use of carbide tools for fast cutting.

Turret clamps and unclamps automatically.

Equally effective on second operation and chucking work.

	No. 2G	No. 3
SPEEDS from	90 to 1800 R.P.M. or 180 to 3600 R.P.M.	60 to 2100 R.P.M. or 100 to 3600 R.P.M.
CAPACITY	1"x6½" turning length	1½"x9" turning length
	Ask for Bulletin No. 629	Ask for Bulletin No. 727

MOREY MACHINERY CO., INC.
410 Broome Street New York, N.Y.

DEARBORN Automatic Chucking and Indexing Fixture

MILLS OVER 1000 PARTS PER HOUR

Work held by draw in collets. Collets open and close automatically. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. Minimum set-up time required. Speeds up production. Positive and accurate in operation.

J. W. DEARBORN

72 S. CLIFF ST. ANSONIA, CONN.

MODEL NO. 16 "SPECIAL"

Constructed as per Specifications of U. S. Naval Aircraft Factories

Reg. U. S. Pat. Off.

Beware of Imitations! Our machine carries the Butterfly trade mark.

BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10" Table; Model No. L—12" Table.

HARVEY MANUFACTURING CORP.

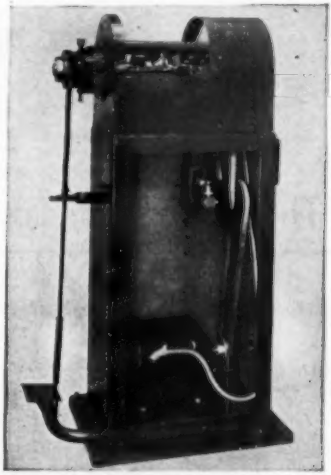
161 Grand St., New York

Phone: CAnal 6-5170

the effect of load. Rebalancing costs are likewise reduced since once the characteristics of a rotor have been measured, sufficient additional data for complete rebalance may be obtained from a single trial run.

Schauer Variable Speed Lathe

Manufacturers producing small metal and plastic parts requiring accurate lapping or polishing will be interested in the new Schauer Ideal variable speed lathe (Type VAIE), which is shown with cover removed.



Speeds as low as 20 r.p.m., plus ample power for heavy work, at speeds up to 4000 r.p.m. are obtainable. These speeds are in a ratio of 5½ to 1, based on the lowest speed desired by using a single-speed motor, or 11 to 1 with a two-speed motor.

Motor is spring-mounted in base; thus automatically controls belt tension. Automatic brake on spindle applies when treadle is depressed to open the motor circuit. Spindle is equipped with 3 or 4-jaw chuck, or special holding fixtures to meet individual requirements.

It is made by Schauer Machine Co., 2064 Reading Road, Cincinnati, Ohio.

Metalworking

A new book on "Metal Processing" is announced by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y. Published at $5.00, this 630 - page volume is a college textbook, but is adaptable also for short and industrial courses.

"Metal Processing" is by Orlan W. Boston, Professor of Metal Processing at the University of Michigan. It is the successor to his two-volume work titled "Engineering Shop Practice" and is the result of 20 years' experience teaching in that field.

This book opens with an introductory first chapter outlining all steps involved in designing for production — selecting the material, fabricated shapes available, the importance of coordinated design, etc. The question of fits and tolerances is discussed briefly, as are the important subjects of routing, time study, and plant layout.

Subsequent chapters treat in detail the various classes of machines, processes, and factors involved so that the student may develop the ability to plan from drawings, the production of a part for various conditions of quantity and quality.

A chapter is devoted to each of the standard machine tools, such as the lathe, milling machine, etc. One significant tool is neglected, however, and that is the contour sawing machine.

This book emphasizes particularly the nomenclature of tools and the subject of machinability. Extensive data are given to show cutting forces, power, tool life, chip formation and surface quality as influenced by the properties of the material being machined, the cutting fluid, and the tool shape and quality.

DOUGLAS

UNIVERSAL SLOTTERS

BUILT IN 3 SIZES

7" STROKE

8½" "

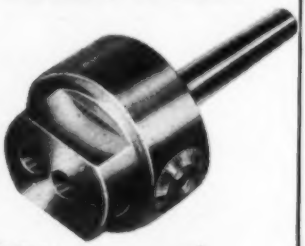
10" "

Large scale production ensures quick deliveries

DOUGLAS MACHINERY CO., INC.

150 Broadway, New York, N. Y.

FRAY
MICROMETER
OFFSET BORING HEADS
ELIMINATE
GUESS-WORK



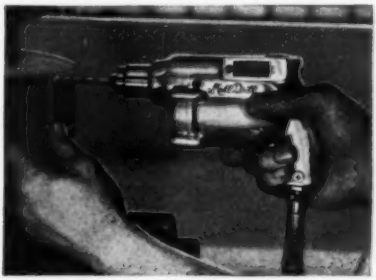
WRITE FOR BOOKLET.

FRAY MACHINE TOOL CO.
MAKERS OF
"ALL ANGLE"
MILLING MACHINES
AND
MILLING ATTACHMENTS.
GLENDALE, CALFORNA
U. S. A.

A New ¼" Malldrill

The Mall Tool Co., announces a new pistol grip ¼" drill. Handy for getting into close quarters, it is recommended for use in the airplane industry, for auto body building, sheet metal work, and wherever high speed production drills are required.

Notable features of the drill include:- Streamline design, - castings are all aluminum die cast to insure high strength and lightweight,-all high speed bearings nest in steel inserts which are cast integral with castings,-extra long brushes - Special easily accessible openings for cleaning commutator and for brush inspection - selected precision ball bearings,lubricated by bearing manufacturer to insure proper amount, as well as proper lubricant for long life and cool operation - Armature is precision balanced - Single pole, Bakelite enclosed switch - gears made of heat treated special alloy steel - all rubber cord with molder strain reliever- Switch guard to protect Bakelite button on switch - improved fan for more efficient air flow - handle is air cooled by a stream of air.



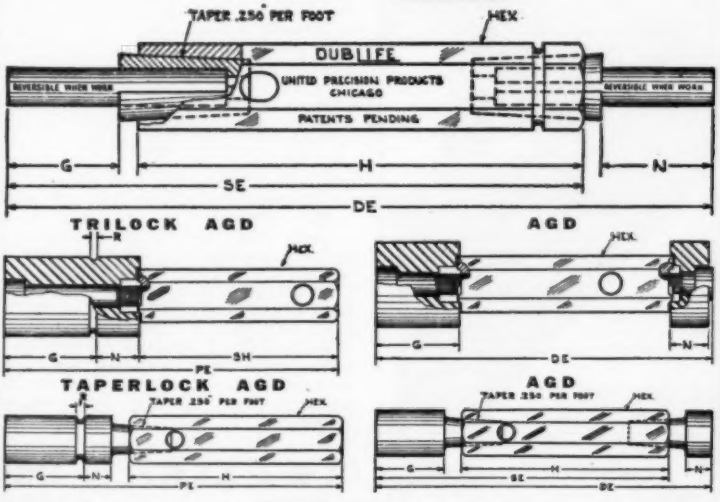
Capacity in steel is ¼". The no load speed is 2200 r. p. m., and full load speed 1800. Net weight, with cord, is 4 lbs., without cord, 3 lbs. - shipping weight 4-¾ lbs.

For additional information address The Mall Tool Co., 7742 So. Chicago Ave., Chicago, Ill.

Pencil Pointer for Draftsmen

A handy device for quickly pointing drafting pencils is offered by Ralpo Products, Canton, Ill. The pencil is held at an angle of about 20° and revolved with the fingers. Very slight pressure is said to be adequate. A chisel point may be formed if desired with the aid of a slot. The pointer may be easily cleaned.

The New **DUBLIFE** *Gauges*



United Precision Products, exclusive manufacturers of Plug Gauges, announce a new improved DUBLIFE Gauge. The handle is made of hexagon material with bronze tapered collet which locks around the plug as it is driven into the handle. The plugs are reversible, so that when one end is worn the other end can be used, thus giving double life. 30,000 gauges in stock ranging from .030" to 1".

A new catalog showing DUBLIFE and AGD Gauges will be sent to those requesting it on company letterhead.

UNITED PRECISION PRODUCTS CO.

4618 W. HURON ST., CHICAGO, ILLINOIS

SOLID OAK OR POPLAR GS
MACHINISTS TOOLCHESTS

Also leatherette-complete line. The right type of chest for for every mechanic from higher grade to more reasonably priced.

BEFORE ORDERING ANY TOOLCHEST, write for our literature.

Geo. Scherr Co.
122 Lafayette St.
New York, N. Y.

NEW! ROGERS
HEAVY-DUTY PRECISION
KNIFE GRINDER

TYPE N T

Extra Large V way. Disc type clutch transmission. 48°, 72°, 90°, 110°, 134°.

S. C. ROGERS & CO.
207 DUTTON AVE., BUFFALO, N.Y.

Chip Formation, Friction and Finish

An illuminating discussion of the latest research findings in the physics of metal cutting is presented in an attractive 48-page brochure issued by Cincinnati Milling Machine Co., Cincinnati, Ohio, copies of which will be sent on request. The authors are Hans Ernst, Research Director and M. E. Merchant, Physicist, Research Dept.

Quoting from the abstract: — "This study shows that the hardness of mating metal surfaces and the resistance to shear at their areas of actual contact are the variables of greatest importance in dry friction. For ordinary dry metal surfaces in contact, resistance to shear is low because of the presence of strongly absorbed films of low shear strength materials, which always cover such surfaces. When, under unusual conditions, these films are practically absent, the coefficient of friction rises to very high values because the metal surfaces have united at their points of contact, and thus the metal itself must be sheared. These principles are shown to have a direct application both in the superfinishing process and other metal cutting operations."

"From the evidence presented, it is apparent that great advances in the field of metal cutting may be made if cutting fluids can be developed which will provide, and maintain, low shear strength material at the chip-tool interface, even at very high cutting speeds."

RAPID COMBINATION SAW

Change from full throat to taper in 30 seconds. Patented handle locks blade tight—change in 2 seconds. All-steel construction—crackle grip handle. 6 Types. Write for complete information.

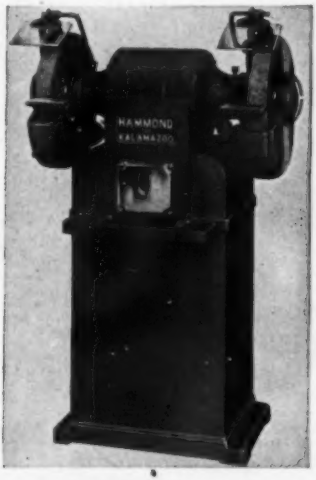
TWO SAWS in ONE

RAPID MANUFACTURING CO.
Box 488, - - Glendale, California

Hammond "OK" Grinders

For tool and light snagging grinding, Hammond Machinery Builders, Inc., 1614 Douglas Avenue, Kalamazoo, Mich., introduce three new, functionally streamlined "OK" model grinders.

Design of the new machines stresses oversize construction for all moving parts such as spindles and bearings. Base of the machine is heavy cast iron with straight vertical lines unbroken by protruding parts to hamper any grinding operations.



Streamlined into the base, at top, is a heavy-duty motor-on-spindle for 10", 12" or 14" wheels—furnished 1, 2 or 3 h.p.—220 or 440 volt, 3 phase, 60 cycle a.c. All motors have a spindle speed of 1750 r.p.m.

Standard equipment includes the heavy-duty motor with over-size ball bearings sealed against dust—push-button starter with overload protection—heavy, exhaust-type, semi-steel guards—adjustable spark deflectors—tool tray and removable water pot—and adjustable tool rests. All moving parts are closely machined and built to rigid machine tool specifications.

"OK" grinders are also furnished as

Fewer Men Turn Out More Work

with

ACE SPOT WELDERS

Thousands of **ACE** Spot Welders are aiding production in many plants engaged in our vital defense program. Their practical design and construction, —their ease of operation and uniform high speed insure more work per hour.

Ace spot welding saves the handling of fasteners such as rivets,—adds strength and saves time because no holes need be punched in the material —increases production without adding to your payroll.

Our Bulletin 40 illustrates and describes the complete range of manual and automatic motor-driven Welders.

A copy will be mailed on request.

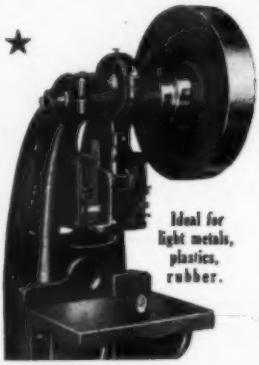
PIER EQUIPMENT MFG. CO.

1418 Milton St.

Benton Harbor, Michigan

4 Punch Press Advantages that will Save You

Time and Money!



INVESTIGATE *the* ROUSSELLE

1. Non-repeating Safety Clutch. Can also be arranged for continuous operation. . .
2. Solid Crankshaft—forgings are not used. . .
3. Automatic Knockout Bar. . .
4. For blanking jobs, this 10H Horn model has a special bed in which a hole may be bored without interfering with the elevation screw. . .

Write TODAY for details . . .

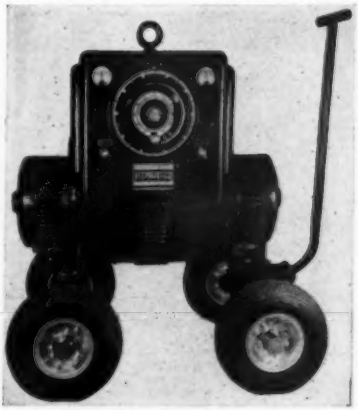
DAVID J. ROSS CO.

BENTON HARBOR, MICHIGAN

a combination grinder-buffer, or with each end of the spindle extended to form a buffing and polishing lathe. Descriptive bulletin GP-12 gives complete details.

Portable Welder Mount

A new four-wheeled light-weight pneumatic tire trailer for mounting all Hobart electric drive welders is announced by Hobart Brothers Co., Troy, Ohio. Easy portability makes this new



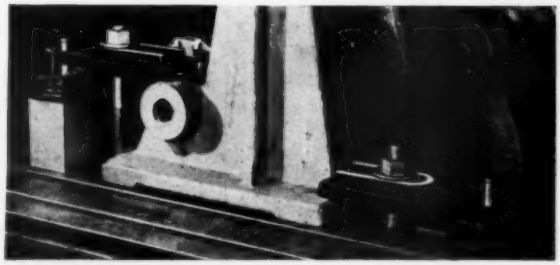
welder mount doubly useful, enabling it to make hurry-up trips to different parts of plants and yards for emergency production, maintenance and repair work.

The trailer is designed so that the mounting is easily accomplished by means of four bolts in the frame of the trailer which register with four holes in the legs of the welding machine. Unit is easily moved by hand by virtue of the low, underslung construction, narrow 27" tread and method of balancing. Trailer is of arc-welded steel construction throughout.

This unit weighs 120 pounds; measures 12⅞" high; 45" overall height; 44" overall width; 33" from hub to hub; 25% tilting angle; 14" jumbo four ply tires.

K-O ADJUSTABLE U CLAMPS

Don't hunt thru the scrap box for blocks to put under your old strap clamps.



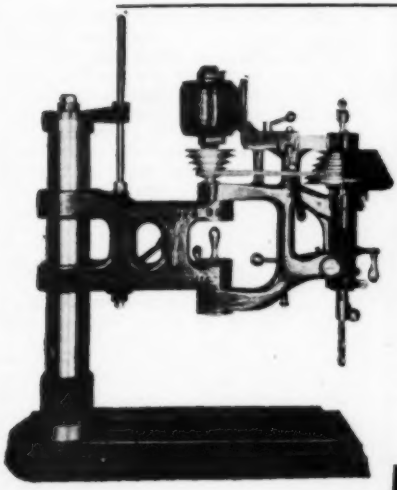
Immediate delivery on the new, self contained K-O Adjustable "U" Clamp with the step elevation base.

Size illustrated is the No. 5, price—$1.75 each.

Send for circular showing all six sizes and three styles with specifications, prices and discounts.

K-O PRODUCTS CO.

Benton Harbor, - - - - - - Mich.



AYER
Sensitive Bench Radial Drills

1/2' and 3/4' cap.

The Ayer Sensitive Drills, either wall or bench types, are widely used in many industries. One plant (name on request) has ten in operation — they started with one.

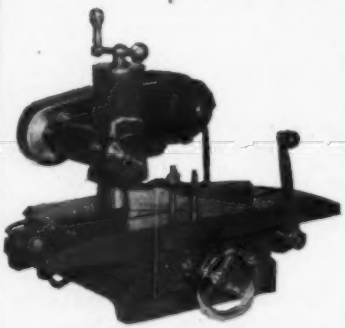
Both drills have the same rigid construction, capacity, range, flexibility, quick control and accurate workmanship.

Write for circular and complete details.

F. H. AYER MFG. CO.,
CHICAGO HEIGHTS, ILLINOIS

NEW Gibson

Carbide Lip Grinder



Designed to meet the demand for a machine to generate and grind lips, or chip curlers in carbide tools, and to provide means for obtaining positive duplication in such work.

These are some of the advantages of the Gibson machine: Low diamond wheel cost; Compactness; Rigidity; Versatility Smoothness of operation; Easy adjustment; Wide range of usefulness and simplicity of application.

All wearing surfaces receive an abundance of oil. The diamond wheel receives lubrication through felt wicks.

For more details on this time and money saving machine, write to

Kokomo Machine Co.

KOKOMO, INDIANA

A Time Saver for Arc Welding

Engineers, supervisors, purchasing agents, operators, and all others who use or supervise the use of arc welding electrodes will want a copy of this new Arc Welderule because of the time

it saves in estimating electrode requirements. Operating in a manner similar to a slide rule, the Welderule reads directly the length of arc welded joints obtainable per 100 lbs. of electrode, also the pounds of weld metal deposited per 100 lbs. of electrode. The information covers 11 different commonly used sizes and types of popular electrodes in both the 14 and 18" lengths.

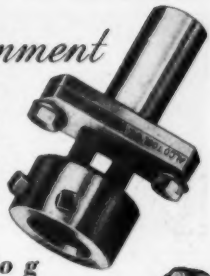
Although general data of a similar nature have been published in bulletin form, this device enables more accurate estimates to be made because it applies to specific types and sizes of electrodes. Being of vest-pocket size, it is handy and easy to use.

An additional feature is a selector chart which shows the various filler metal classifications as specified by the American Welding Society and the types of electrodes which meet these classifications. The new Arc Welderule may be obtained from any local G-E Arc Welding Distributor, G-E Sales Office, or from General Electric Co., Schenectady, N. Y.

PROPERLY DESIGNED TO SPEED PRODUCTION

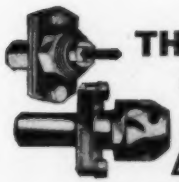
THE ALCO BUTTON TYPE *Die Holder*

with adjustable concentric alignment



This tool, with its adjustable concentric alignment feature, saves set-up time and eliminates the difficulties your set-up men have always had in getting proper concentricity when using button dies. With this ALCO button type die holder you are assured of straight threads . . . better threads. Until the introduction of this revolutionary ALCO tool, many manufacturers, because of set-up difficulties, had discontinued the use of button dies. Now again, they are using them advantageously and economically.

Write for Catalog

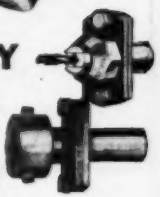


THE ALCO TOOL COMPANY

835 HOUSATONIC AVE., BRIDGEPORT, CONN.

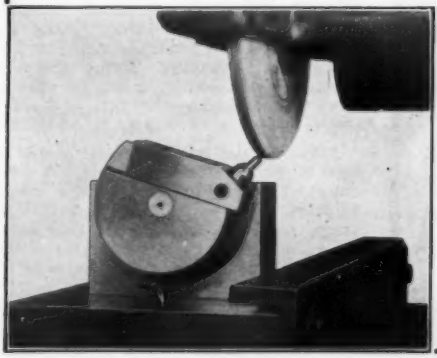
Detroit Office: 908 Stephenson Bldg.

ALCO EFFICIENT TOOLS



Welch Quick Angle Dresser

The WELCH Quick Angle Vernier Type Dresser speeds up the accurate dressing of grinding wheels to any required angle. It is quick and easy to use . . . accurate and precise in the results obtained.



This dresser is graduated in degrees on the revolving dial with the zero mark at bottom of base block. The Vernier is cut into the base block so that readings can be made in degrees and minutes. This unique arrangement of the Vernier as an integral part of the base block eliminates the possibility of error. After setting dresser to the required angle, tighten knurled hand knob and dresser is ready for use.

These dressers are carried in stock assuring you IMMEDIATE DELIVERY. Write or wire TODAY. THIRTY DAY FREE TRIAL if desired.

WELCH INDUSTRIES
INCORPORATED

Makers of HIGH SPEED MILLING CUTTERS
FORM TOOLS and SPECIAL TOOLS

19900 W. Eight Mile Road
DETROIT, MICHIGAN

"Stark"
"ELECTROBLAST"
No. 2 Full Muffle Type Furnace

High grade insulated Furnace. Silicon Carbide Muffle 7"x4½"x3½". Complete with built in blower ready to run, $138. Blast actuated by powerful Universal ball bearing motor. May be had as a Hydrogen Brazing Furnace complete with Pyrometer as illustrated, $266. Unit will reach 2350°F. in less than an hour at 10c per hour. Indispensable for small intermittent jobs. Write for descriptive literature.

STARK TOOL CO.
Originators of the American Bench Lathe
Est. 1862 Waltham, Mass.

NIELSEN
Heavy Duty
Live Centers

Write for catalog on live centers

Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

NIELSEN, INC. LAWTON, MICH.

New Tachometer Has Many Uses

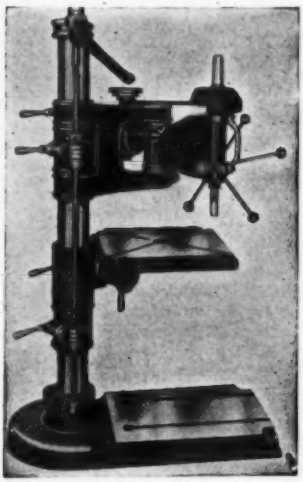
For use in measuring r. p. m., feet per hour, gallons per minute in any manufacturing plant where rotating equipment is used, a new a. c. tachometer is announced by Westinghouse.

Known as Type A-80, the tachometer consists of an a. c. generator and a voltmeter of the rectifier type. No brushes or commutator are used in the generator which is of the permanent magnet, a-c inductor type. To insure permanency of calibration the magnets are made of high grade magnet steel and are carefully aged.

The rotating element consists of laminated iron keyed to a rust resisting steel shaft. Laminations are slotted to permit variation of the air gap reluctance when the shaft is rotated. This in turn varies the flux linking the voltage coils and induces an alternating voltage in the coils. The alternating voltage is rectified by a Rectox unit in the voltmeter calibrated in r. p. m., feet per hour, or other units as required.

Although the best generator speed is 1000 r. p. m., the tachometer is recommended for operation over a range of from zero to 5000 r. p. m. This range may be obtained, if necessary, by suitable pulleys, gears, or sprockets. Over-all tachometer accuracy is—½ per cent of full scale.

Address Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., for full details.



MAKE YOUR DRILLING JOBS EASIER

Increase Profits . . . Speed-up Production

End Worker Fatigue . . . Increase Efficiency

by using this

DRILLMASTER RADIAL DRILL

Economical in operating and first cost, this floor type, heavy duty, precicion-made, well-balanced Radial offers many features that merit your careful consideration. Drilling to the center of a 36" circle, No. 2 Morse Taper and heavy duty ½ HP ball bearing motor. The full floating, ball bearing spindle assures free and sensitive operation at all speeds.

Send TODAY for bulletin giving full details.

Wm. C. Johnson & Sons Machinery Company
St. Louis, Missouri

USEFUL

In Any Modern Shop

This sturdy 36"x48" Milwaukee Surface Plate is of semi-steel construction, accurately machined, provided with cross ribs every 10½" for rigidity, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Shipping weight 1200 lbs.

We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired.

Write today for full information.

J. C. BUSCH COMPANY ENGINEERS AND MACHINISTS SINCE 1907
165 SO. BARCLAY ST., MILWAUKEE, WIS.

Ampco Publishes New Catalog

Ampco Metal, Inc., Milwaukee, Wis., announce Catalog 22 describing Ampco Metal, an alloy of the aluminum bronze class. The new book is well illustrated with photomicrographs, parts, and factory views. It contains descriptions of the alloys and a comprehensive table of physical properties and range of chemical composition.

Each grade of Ampco Metal is described in detail in the new catalog, and included with it are illustrations of castings made from the particular grade under discussion. These depict the wide range of parts that are made from this alloy.

The use of Ampco in bushings, gears, acid-resistance service, and dies is discussed, while other topics include centrifugal casting, welding rod, forging, and machining. One table covers the uses of Ampco Metal by grades.

The book has been streamlined to 24 pages, letterhead size, for convenient filing. Engineers and metallurgists who are interested in aluminum bronze are invited to write for copies.

Handbook on Contour Sawing

Of particular interest to Doall operators, vocational teachers, N. Y. A. officials and trainees, is the New Contour Sawing Handbook published by Continental Machines, Inc., 1300 S. Washington Ave., Minneapolis, Minn.

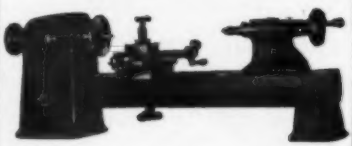
This Handbook contains complete information on the art of contour sawing and its applications and will assist the training of operators, as well as being a reference guide to application.

The Handbook contains 158 pages devoted to illustrations and guide charts covering all phases of contour sawing and filing of metals to any desired shape. Comparisons of contour sawing with other machining processes such as the shaper, nibbler, lathe, miller, and torch cutting are made in the first section of the Handbook. Section two illustrates application and work accomplished by contour sawing. Section three gives a short resume of machine tools and their direct effect on our standards of living.

Wrigraph
PRECISION
DRAFTING MACHINE
Brief Case Size Illustrated.
New large INDUSTRO
Drafters available — tubular arm, ball-bearing machines. Complete range of sizes up to 36"x48".
Free trial offer and catalog on request.
L. G. WRIGHT, INC.

9213

AMES BENCH LATHES



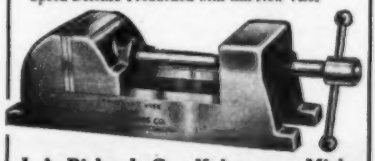
Precision lathes for doing most accurate turning, drilling, milling, threading, filing, polishing, in the tool room or in production.

Send for Complete Information

B. C. AMES COMPANY
WALTHAM, MASS.

DOUBLE YOUR DRILL PRESS CAPACITY

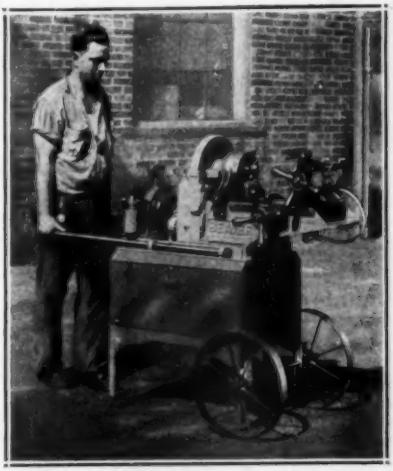
Minutes are Seconds with the new TWISTITE Vise.
Opens to full capacity in one second.
Speed Defense Production with this New Vise.



J. A. Richards Co., Kalamazoo, Mich.

Carrying Tools to the Job

Aimed straight at production inefficiency resulting from time losses incurred while work in process is moved considerable distances within a plant to motors, tools, and light machines, for subsequent operations, Warren Steel Specialties Corp., 102 Niles Ave., Warren, Ohio developed a portable carriage. It is constructed to enable workmen to wheel awkward-to-handle, and lightweight but hitherto stationary machines direct to the job rather than carrying the work back and forth through tool rooms or the factory. Carriage is constructed of angle iron, channel, and heavy gauge auto body sheets welded together. Carriage has handles for the workmen, without helpers, to lift and guide the apparatus direct to their bench or job where it will then remain stationary.



The Warren Carriages are available in any practical size. The manufacturer says they are especially useful in factories which, during this preparedness rush, are crowded; and, also for plants where more than one man uses the same tool or machines at different intervals. Loaded with necessary equipment, the carriages are useful on construction jobs. The designer's purpose is to fabricate the Warren Carriage to suit the individual needs of equipment manufacturers. The company states that one tool and one motor manufacturer are now supplying this type of carriage as part of their regular equipment.

THE PRECISION UNIVERSAL TOOL HEAD

brings all adjustments under absolute micrometric control of the operator without stopping tool or machine. In Jig Borer, Milling Machine or Horizontal Boring Mill, it bores, faces, counterbores, turns outside diameters, mills flat surfaces and slots, under-cuts, recesses, back-faces and does an almost limitless range of "headache" jobs. Send for bulletins. Address all communications, inquiries and orders to

THE PRECISION TOOL COMPANY
P. O. BOX 155, BROOKLYN, NEW YORK
Cable Address: "Pretool-New York" Tel: MAin 4-1064

RECLINABLE POWER PRESSES

We manufacture a complete line of mechanical power presses, with sizes and types for every need in your shop.

Write for bulletins.

ZEH & HAHNEMANN CO.
Newark, New Jersey

PRODUCE

Low Cost

Accurate Keyways

with the Glenny Adjustable Expansion Broach. Eliminates set-up time. Self aligning. Interchangeable parts. Adapted for arbor presses. Speeds up production.

Write for details.

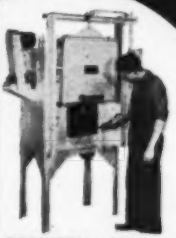
EAST SHORE MACHINE PRODUCTS CO.

833 E. 140th St., Cleveland, O.

TEMPERING · DRAWING

TOOLS, DIES, PRECISION PARTS

Despatch "CF" Furnaces provide accurate, uniform, speedy tempering and drawing and other heat treating processes for tool room, production, and metallurgical laboratory. Equipped for gas or electric heating. Write for Bulletin No. 83 C.



DESPATCH "CF" FURNACE

275° F. to 1250° F.

DESPATCH OVEN COMPANY

MINNEAPOLIS, MINNESOTA

Tungsten Conservation

The steadily increasing demands for vital materials from industries engaged in defense tooling and production have inspired widespread, intensive research into effective means for conserving strategically important tungsten.

A commendable step in this direction is revealed in an announcement by The Forging & Casting Corp., Ferndale (Detroit), Mich., of a new line of electrically welded composite steel blanks for the making of dovetail forming cutters for use on automatic screw machines.

The blanks are made by electrically welding, by a special process, a cutting face of high speed steel to a non-hardenable base of mild steel, thus reducing by at least one half the quantity of high speed steel required for a tool of a given size, resulting, of course, in a proportionate saving of tungsten.

Unlike some methods of alloy conservation which involve principally the use of substitutes, these composite steel blanks, according to their manufacturer, offer distinct advantages of their own over the usual solid high steel construction that they replace. Important among these advantages is the fact that the non-hardenable tough base minimizes the inherent tendency of solid high speed steel tools, during heat treating or because of excessive strain when working, to break out at the sharp dovetail corners or at the screw holes where the tools are attached to the holding fixture.

DON'T CUSS when your taps break off . . .

THE "WALTON" TAP EXTRACTOR will remove them easily and quickly

No longer necessary to anneal the broken tap. The steel fingers of the Extractor inserted in the flutes of the broken tap, remove the broken piece intact. Made in all standard sizes from No. 4 to 1½". 2, 3 and 4 flute styles.

Will you give it a 30 days free trial?

Ask for Folder 131.

THE WALTON CO., 95 Allyn St., Hartford, Conn.

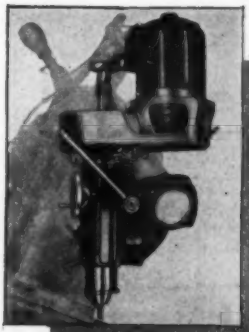
Controlled Carburizing

So that everyone interested in carburizing can become familiar with a method, now used in many heat-treats, which is said to put a case of just the specified thickness on a variety of work . . . gears, spindles, bearing-cones, bushings, camshafts, etc. . . . the Leeds & Northrup Co. offers a 28-page catalog . . . "Homocarb Method for Carburizing."

Different from most carburizing publications, this book takes the reader on a pictorial tour of representative heat-treats . . . shows a score of furnaces in action . . . shows the various types of work being carburized . . . and even tells how results are obtained.

In addition to many action photos, there are diagrams, charts and photo-micrographs which demonstrate how and why the Homocarb Method is said to enable a heat-treater to "get the case he wants."

Anyone who wants a copy of this publication may have it by addressing the Company, 4934 Stenton Ave., Philadelphia, Pa., and asking for Catalog T-623.



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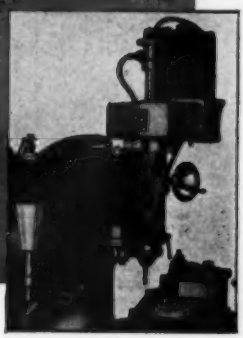
AND TURCHAN

HYDRAULIC DUPLICATING UNIT

Model A HC Eklind Turchan Duplicating Attachment is designed and priced for die shops making Bakelite, Plastics, Rubber and Drop Forge molds and dies. Will handle average work efficiently, economically and speedily. Oil pressure controlled by tracer, feeds spindle and tracing arm to follow model accurately. Die capacity is 18" long by width depending on cross feed of machine. Capacity can be increased by [illegible] head on side of overarm.

Model A H Eklind Universal high speed Milling, Drilling and Boring unit is a most valuable tool room aid. Can be had separately and the duplicating attachment added later.

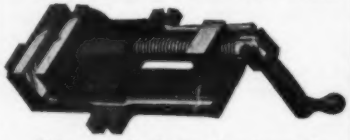
Send for our bulletins giving full details and prices.



UNIVERSAL HIGH SPEED TOOL CO.

551 W. Washington Blvd., Chicago, Ill.

YOST DRILL PRESS VISE



This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	3¼	12½
2D	5	5½	23

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY
1335 SO. MAIN ST.
MEADVILLE, PENNSYLVANIA

GRIT-CUT ABRASIVE CUTTER

Designed for tool rooms. Can be utilized for light production. Two convenient sizes for mounting on bench. Legs supplied at an extra cost. An inexpensive cutter costing only

$140.00

Does quick and accurate cutting at minimum cost. No job too hard for Grit-Cut.

For quick repairs the cartridge type spindle can be removed and assembled spindle substituted.

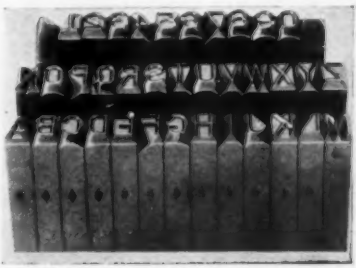
The No. 6 machine capacity is 1" solid or 1¼" tubing. Size of wheel is 6". Motor is ¾ h.p., 3450 R.P.M. Spindle speed 10,000.

Let us send you complete details.

TUBE METHODS, INC.
Depot & Rambo Sts., Bridgeport, Penna.

Hardened Steel Stamping Type

Acromark has developed a new precision stamping type for use in gang holders or mortised dies to number parts. The type is made of a shock

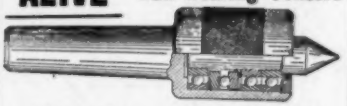


resisting alloy tool steel engraved "true centre" for perfect spacing and alignment. Each piece is carefully hardened, tempered and ground to size. It is suitable for stamping steel, alloy steel, cast iron and other metals or materials.

Best deliveries can be made on sizes ranging from $\frac{1}{16}$" to $\frac{1}{8}$" but the type is available in all sizes from 1/32" to 1". The length of each piece standard is type high or 1" but lengths to suit needs can be furnished at slight extra charge.

A new catalog No. 52 illustrates many new marking tools and machines made by The Acromark Corp., 259 North Broad St., Elizabeth, N. J.

"ALIVE" Ball Bearing Centers



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Write TODAY — and let us tell you more about them.

MODERN MACHINE CORP.
323 Berry St., Brooklyn, N. Y.

Eliminate Those Bottlenecks In Your Tool Room
Install One Or More Oliver Die Making Machines

* * * * *

You can use less skilled mechanics and you will obtain better work in less time.

"A real time and money saver".

* * * * *

Every productive hour counts today so start in the tool room and on your production filing jobs to save 50 to 60% over hand methods.

SEND FOR LITERATURE

OLIVER INSTRUMENT CO., 1408 Maumee St., Adrian, Michigan

WHAT WOULD IT COST YOU TO MAKE CHUCK JAWS TO HOLD THIS PIECE ?

SEND FOR THIS FOLDER TODAY

To make chuck jaws to hold this forged brass part by the usual fitting and filing methods would be a slow, tedious task. And for most purposes the cost would be prohibitive. Yet you can produce durable chuck jaws of extreme accuracy for this job, using *Cerromatrix*, for less than ten dollars—total cost of material and labor. The process is explained in detail in a new illustrated folder, together with the complete story of several other interesting jobs. Send for it today.

CERRO DE PASCO COPPER CORPORATION
40 WALL STREET NEW YORK, N. Y.
BRITISH ASSOCIATES: MINING & CHEMICAL PRODUCTS LTD., LONDON
CANADIAN DISTRIBUTORS: DOMINION MERCHANTS LTD., MONTREAL

ARMGLO

Manufacturers of Resistance Welders—Foot, Motor, Air and Hydraulic operated.

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Standard and for specific applications with and without electric timing control.

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Bench type filing and sawing machines and abrasive band finishing machines.

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ARMGLO COMPANY
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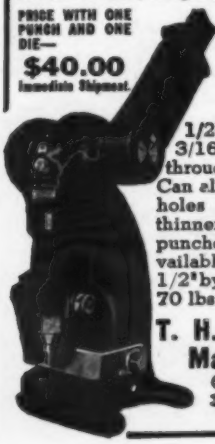
T. H. L. FRONT LEVER
BENCH PUNCH

Built for hard, tough work — die cannot lose alignment with punch — all parts interchangeable.

PRICE WITH ONE PUNCH AND ONE DIE—
$40.00
Immediate Shipment.



Capacity — 1/2" holes through 3/16" steel; 13/32" through 1/4" steel. Can also be made for holes up to 7/8" in thinner metal. Stock punches and dies available from 1/16 to 1/2" by 64ths. Weight, 70 lbs.

T. H. Lewthwaite Machine Co.
(Est. 1890)
311 E. 47th St., NEW YORK

Magnetic Indicator Base

The Mellaphone Magnetic Indicator Base is said to differ from the ordinary design in that the base itself is a powerful magnet. To this feature are attributed a number of advantages.

The magnetic base will hold tightly to any iron or steel surface, providing quick indicator settings, even in "awkward to reach" places. It may be used upright, horizontally, or in an inverted position and can be removed quickly or placed on any machine.

Since the base area (2" x 2½") is smaller than the non-magnetic base, space restrictions become unimportant, yet the magnetic pull is asserted to hold the base so tightly that it will not rock. Should work accidentally jam against the indicator, the base will tip before damage is done to the indicator.

The upright post is threaded into the center stud of the magnetic base. Three sizes of posts (5/16", ⅜" and ¾") are available in non-magnetic material to fit any indicator.

The magnetic material used is genuine "Alnico," a patented alloy of aluminum, nickel, cobalt, and pure iron. The strength of the magnet is more than ample to support the indicator at the extreme end of the pots, in any position. The magnetic strength will last indefinitely without weakening. The device is made by Mellaphone Corp., Rochester, N. Y.

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- Ideal Location
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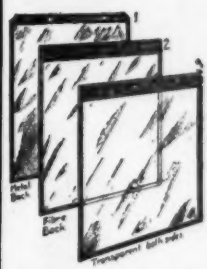

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are made in two, three and four-way types for air, oil, water, steam, gas, etc., pressures to 5000 lbs. Style E is a general purpose valve for pressures to 300 lbs. Various metal combinations to suit any medium. Style J is for air and oil only, pressures to 125 lbs. Style H is a balanced hydraulic valve for pressures to 5000 lbs. We also manufacture foot, solenoid and motor-operated valves.

Style J

Style E

Style H

Bulletins on request.

OTHER NICHOLSON PRODUCTS: Mandrels, Arbor Presses, Flexible Couplings, Steel and Stainless Steel Floats, Steam Separators, Steam Traps, Air Separators, Air Traps, Air Vents, Etc.

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ARBOR Presses
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Scientifically designed, accurately machined from selected materials. 40 STOCK SIZES and MODELS (bench and floor types).

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STEEGE Drives are easily installed—prices $35.00 up—sent on 30 days' approval.

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Corrective Eye Protection

Many of America's 13,000,000 industrial workers are visually deficient and should wear safety goggles fitted with hardened prescription lenses which not only correct but also protect vision so that maximum safety and working efficiency are assured. Unfortunately, available statistics reveal that only 50 per cent of workers who need corrective glasses actually possess them.

In view of the present national emergency, and the tremendous importance of maintaining health of our skilled as well as unskilled workers at the highest peak of efficiency, American Optical Co., Southbridge, Mass., announces it has made available seven different styles of safety goggles fitted with Super Armorplate lenses that can be ground to prescription. Both eye-correction as well as eye-protection for industrial workers with defective vision are thereby provided.

These special protective - corrective safety goggles, according to the announcement, include spectacle and side-shield types for different kinds of eye hazards, and the extra - strong, hardened Super Armorplate lenses can be obtained in either clear white or Calobar and Crookes glare protection glass.

Economical Live Ball and Roller Bearing Centers are going to play an important part in our National Defense Program.

FOR LATHES, HAND SCREW MACHINES, GRINDERS and MILLS

The features that interest you most:

1. Simplicity, sturdiness, and heavy duty.
2. 50% more radial load carrying capacity than the average live center.
3. Large spindle, small head, short overhang, most desirable for rigidity and to be free from chatter.
4. With the aid of cap screw you can lock spindle to redress point right in your machine.
5. Special oil seal to retain lubricant and keep out foreign matter.
6. A compression pad to compensate for heating and expansion of metal as a safety factor, with reasonable diligence exercised.

A folder giving prices and complete detail will be mailed to you upon request.
A ten day trial. If not perfectly satisfied your money will be cheerfully refunded.

MOTOR TOOL MANUFACTURING CO., **12282 TURNER AVE.** **DETROIT, MICHIGAN**

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SEAL IT TIGHT - MOUNT IT RIGHT - USE ACME FLAT LAPPING - LESS THAN FIVE MILLIONTHS INCH FROM ABSOLUTE FLATNESS BY MECHANIZED PROCESS INSURES BETTER VALVE OR ROTATING SEAL PERFORMANCE - CUTS COSTS AND SIMPLIFIES YOUR ASSEMBLY PROGRAM . . .

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★ Acme flat lapping provides a perfect seal because the mating surfaces can be finished to within .000005 inch from absolute flatness. This, together with correct mounting, insures a seal which is initially tight and will remain so indefinitely. Acme Advice Is Yours For The Asking.

Answer This Message Today!

★ Find a better solution to *your* sealing problem. Send blueprint or sketch of your seals, or details of your sealing requirements where fluids must be retained around rotating shafts, or by disc type valves.

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Makers of Standard Jig and Fixture Bushings

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Have you our Engineering Data Sheets on the new line of

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Machine Tool Coolant Pumps?

Made in four types; 1/30 and 1/10 h. p. for small machine tools and machines requiring from 4 to 10 G. P. M.

Write for descriptive literature.

The Ruthman Machinery Co.
1819 Reading Rd., Cincinnati, Ohio

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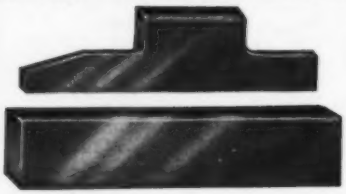
CENTERLESS GRINDER BLADES



- 10-30 Times Longer Life
- Reduce Replacement Costs
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TUNGSTEN CARBIDE WEAR STRIPS

Made in Any Length, Shape or Size

METAL CARBIDES CORPORATION
YOUNGSTOWN, OHIO

Thor Pneumatic Die Grinder

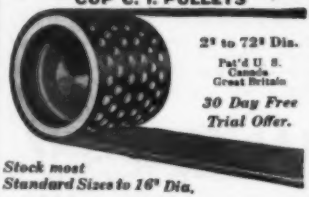
Powered to perform such heavy, continuous duty work as die grinding at full operating speed and particularly adapted to grinding of fins on airplane engines, a new Thor OOH Rotary Pneumatic Grinder is announced by Independent Pneumatic Tool Co., 612 W. Jackson Blvd., Chicago, Ill.

Built for operating small grinding wheels, the new Grinder is extended in the reduced diameter of the spindle support to answer requirements of small clearances and to assist further in clearing obstructions.

Bulletins on Chains

S. G. Taylor Chain Co., Hammond, Ind., has released a new series of bulletins bound in catalog form. This 28-page, 8½"x11" catalog illustrates and describes many types and grades of chain made by the manufacturer. One section is devoted to sling and crane chains; the other features BBB coil chain, high carbon electric weld loading chain, etc. Of interest to engineers, maintenance men and other chain users is the data relating to "proof tests," chain terminology and tables illustrating safe loads for chains and slings for different variations in the angle of the load.

NO BELT SLIPS WITH VACUUM CUP C. I. PULLEYS



2" to 72" Dia.

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30 Day Free Trial Offer.

Stock most Standard Sizes to 16" Dia.

Shut Off Expense Caused by Slippage You Save Money on Every Installation

NEW LOW PRICED PRODUCTION LINE

SOME OF SIZES LISTED BELOW **Send for List—On the Shelf**

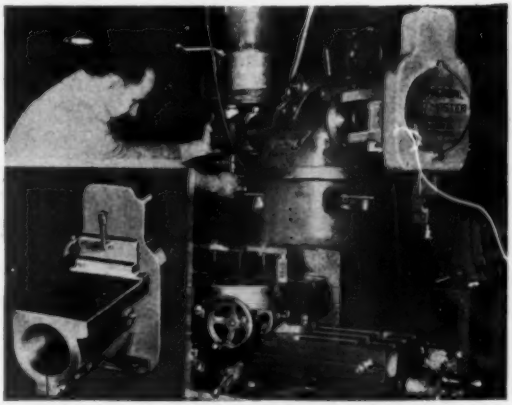
Dia.	Face	Price	Dia.	Face	Price
2"	x2½"—	$1.25	4"	x3½"—	$2.85
2½"	x2" —	1.45	4½"	x5" —	3.95
3"	x3½"—	2.25	5"	x4½"—	4.25
3½"	x3" —	2.55	6"	x5" —	4.75

Increase your Production

We supply Fractional Dia. and Face Pulleys—From large casting stock.

VACUUM CUP METAL PULLEY CO., INC.
12535 Grand River Ave., Detroit, Mich.

Slotmaster With C. I. Housing



Cooperating with the defense program, Experimental Tool & Die Co., 12605 Greiner Ave., Detroit, announce a revised design of their Universal Slotmaster that provides for the use of a cast iron housing instead of an aluminum one. The change in no way impairs the efficiency of this slotting head that converts any milling machine into double duty equipment.

A four-page catalog is available that not only describes and illustrates the Slotmaster, but also shows this redesigned housing and an assortment of ten H. S. S. slotting tools which are available at a small additional cost.

Composite photograph illustrates redesigned housing adaptor and round over arm milling machine and shows how the Universal Slotmaster is adapted as permanent equipment to a Bridgeport Vertical Milling Machine—it may be quickly changed over from one to the other.

Aluminum Furnace Bulletin

A new bulletin on Aluminum Melting Furnaces, is announced by the Fisher Furnace Co., Chicago.

It covers the complete range of types and sizes produced including the AMM Furnace which accommodates a 2000 lb. charge of magnesium alloy. All of these furnaces are, of course, available for oil fuel if gas is not available.

THE BARNES

Motor Driven Precision Cutter Grinding Machine

For precision Grinding Formed Milling Cutters used in the manufacture of rifles, pistols, etc.

General Machinery Corp.

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Telephone Liberty 4826

Stacking Boxes

No. 601—10"x16"x6"—18 ga. ..... $ .95
No. 602—12"x18"x8"—16 ga. $1.25

An excellent all-purpose shop box. Sturdy all-welded construction. Heavy skids act as a positive stacking lock and re-inforce box at point of maximum wear.

Taper Pans

No. 101—10"x18"x6"—18 ga. ....$.75
No. 102—12"x20"x6"—16 ga. ....$.90

One-piece, all-welded construction. Hook handle at each end.

Prices F. O. B. Factory, Phila., Pa.

Immediate shipment from stock—Order Today

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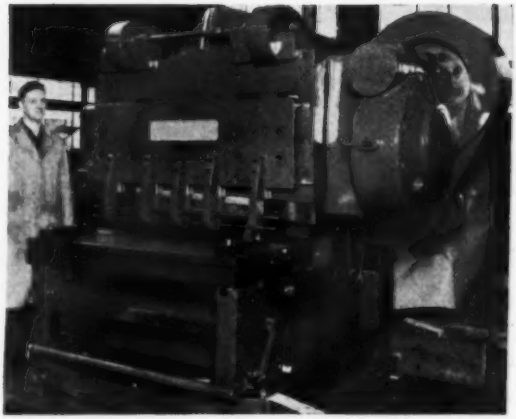


This is one of the new 6204 Cincinnati 4 ft. x 1 in. Rolling Mill Shears, built by The Cincinnati Shaper Co., and recently furnished the Anaconda American Brass Co., for continuous mill cutting of brass and zinc. Features include rolled steel plate construction, hydraulic holddowns, automatic lubrication, 30 strokes a minute. Net weight is approximately 40,000 lbs.

Moulded Plywood Boats

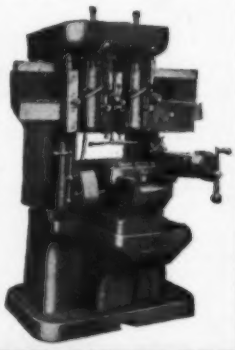
The July issue of the Bakelite Review presents an interesting story of the Hydrolite Process, a development of Skaneateles Boats, Inc., used in the construction of molded-laminated plastic dinghies. Several pictures of manufacturing processes and the finished boats add to reader interest.

Address the Bakelite Corp., 30 East 42d St., New York for a copy.

MOREY No. 12M *High Speed* Vertical Profiler and Miller

Production of interchangeable parts requiring milling of any contour or outline can be materially speeded up by this Profiling and Milling Machine.

Ask for Circular No. 680-A



Morey Machinery Co., Inc.
410 Broome Street, New York, N. Y.

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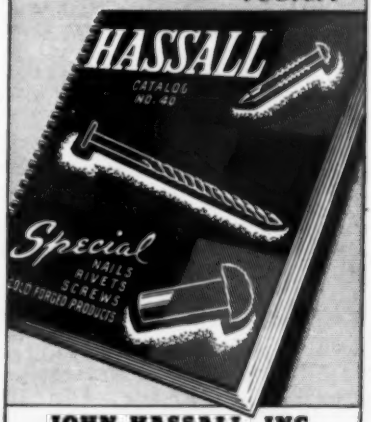

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CLAY & OAKLAND STREETS
BROOKLYN, N. Y.

THE MIDGET

Latest Addition to Our Line of Indicators and Gages

Designed for those 'Hard To Get At' Places.

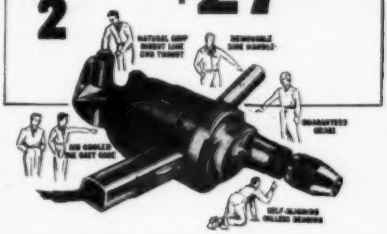
Full Size

Waltham Dial Gage Co.

STOW, MASSACHUSETTS

SpeedWay

1/2" DRILL $27.50



This full capacity, industrial ½" Drill is handier, more powerful and an all-around better drill than many costing a third more. Specially wound high torque, forced-air cooled motor. Improved "natural grip" end and breastplate handle applies thrust directly behind drill point—and all quality features—oilless bearings, streamlined die cast case, etc., etc.

SPEEDWAY MFG. CO. 1822 S. 52nd Ave., Cicero, Ill.

Blade Breakage Stopped Production Insured

BY INSTALLING

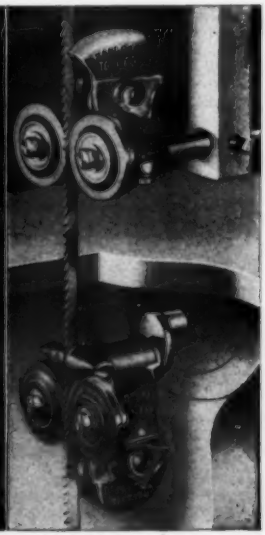
PADDOCK Ball Bearing BAND SAW GUIDES

Recommended for New and Old Machines cutting all material at any speed.

SENT ON 10 DAYS' TRIAL

The use of Paddock Ball Bearing Guides increases the efficiency of the machines so that more and better work can be done. The hazard of operation is reduced. Most of the blade breakage is eliminated. Wheels are interchanged—in effect, three sets of guides in one.

Write for details today and list of prominent manufacturers using Paddock Guides.



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Guide Makers Since 1920

1418 Walnut St., Kansas City, Mo.

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Let Us Do Your Special Gage Work

We have every facility — adequate precision equipment and expert workers—for the quick and efficient production of all types of Gages, Special Tools, Dies, Jigs and Fixtures, large or small. We have complete heat treating equipment and can handle jig boring jobs on our 18"x36" Pratt & Whitney jig borer. Have been delivering satisfaction since 1929.

Address all inquiries to Ray W. Rice, Manager.

QUALITY TOOL & DIE CO.
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Standard Since 1911

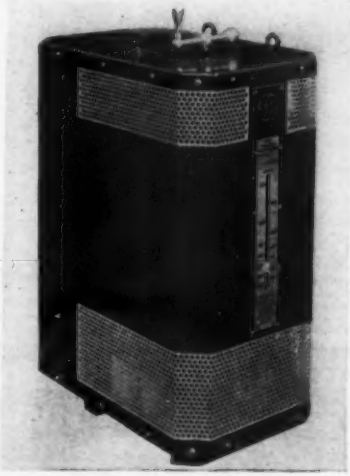
L&J

INCLINABLE POWER PRESSES

L & J PRESS CORP.
successors to Lochbouch-Jordan Tool & Machine Co.
1675 STERLING AVE ELKHART INDIANA

Atomic-Hydrogen Arc Welders

General Electric 35-and 75-ampere atomic-hydrogen arc welders of improved design at reduced prices have recently been made available. Atomic-hydrogen welders are finding increasing use in industry for repairing tools and dies; for filling in flaws or blowholes in steel and bronze castings; and for the fabrication and repair of hard-to-weld metals.

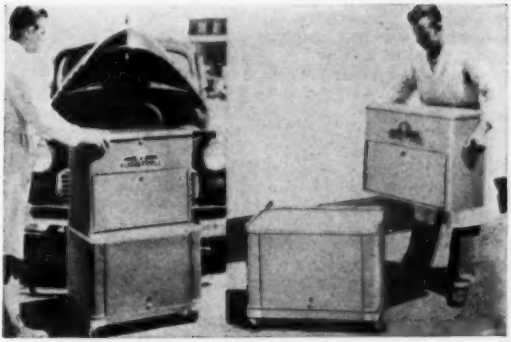


Modern in design, the new welders are compact and self-contained to reduce space requirements and for increased portability.

Instead of the transformer and reactor used in previous units, the new welder has a specially designed reactive transformer which combines the functions of both the transformer and reactor. As a result, the weight of the welder has been reduced more than 30 per cent, and electrical characteristics improved.

Built-in power - factor correction, a feature of the new welders, helps to reduce installation cost and avoid power - factor penalties. Fan - forced ventilation provides cool operation, even at high currents or on high duty cycles.

Wheel About Tool Cabinet



Plomb Tool Co., Los Angeles, Cal., announces the Wheel About—a mobile tool cabinet built on the principle of the "add-a-shelf" book case. It consists of the Wheel About roller cabinet, on top of which may be mounted, by bolts provided for this purpose, the Master Tool Chest.

The assembly permits moving the complete tool set from job to job, or removal of either the upper or lower tool chest complete for use on outside jobs.

The Wheel About cabinet, mounted on four easy-rolling casters, is large enough to carry a tote tray, has lock and key door that lifts up and slides out of the way.

The Master Tool Chest has four drawers operating on roller slides. Top lifts up, and has clips for holding speeders. Lock and key identical with lower unit.

Both units are round cornered and painted Chinese red.

Wheel About complete (No. 9998-1), overall cabinet measurements are 44" high by 27" wide by 17" deep. Weight, 112 lbs. Wheel About unit alone (No. 9998-2), cabinet measurements 22" high by 27" wide by 16" deep. Weight 37½ lbs. Master Tool Chest alone (No. 9998) 20½" high by 27" wide by 12" deep. Weight 75 lbs.

"ALNOR" Velometer

An All Purpose Air Velocity Meter

—Instantaneous, Direct Reading.

Measures total and static pressures as well as velocities.

write for catalog

ILLINOIS Testing Laboratories, Inc.

150 W. Hubbard, Chicago

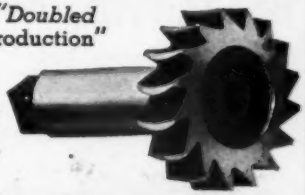
The *New* Aber

Curved Tooth

WOODRUFF KEYWAY CUTTER

"Doubled Production"

according to reports.



Many advantages over old-type keyway cutters:

More cutting edge — Gives shearing cut

Cuts 50% faster — Easy to sharpen

More cuts per sharpening

Full line standard sizes, round or square end shank, in stock. Special size cutters made to order.

Circular with prices, on request.

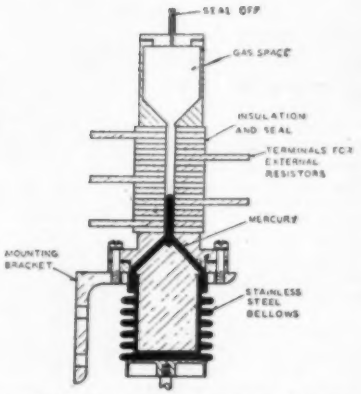
ABER ENGINEERING WORKS

1613 Flett Ave. — Racine, Wisconsin

Mercury Control Has Power Amplification

A column of mercury in a glass tube, one of the oldest devices for measuring temperatures or atmospheric pressure, has been turned experimentally into an ingenious new device that may become the basis of a most versatile system for regulating motor speeds.

Instead of using a glass bulb below the column to act as a mercury reservoir, Westinghouse Research Engineer K. A. Oplinger uses a stainless-steel bellows. Sealed into the column rising above it are electrical contacts, spaced roughly ⅛" apart. As the bellows is compressed, the mercury rises and successively short-circuits contacts, forming thus a series of mercury switches. Because of the large ratio of bellows area to the cross section of the capillary, only a slight compression of the bellows raises the mercury the full height of the tube. In fact, in an experimental model only .015" movement of the bellows covers or uncovers the 40 contacts, a ratio of about 150 to 1. The bellows can be actuated by a mechanical driver, such as a cam or lever, so it can be used as a speed-control device, contacts in the tube controlling a motor rheostat; or an electro-magnetic element can make it respond to changes in voltage or current.



The device is, in effect, an amplifier. The full mercury column can be raised by a change of 0.05 watt in the soil driving the bellows. Change in power controlled may be 5000 watts; thus power amplification is 100,000.

Because of low voltage between adjacent contacts and because contacts are sealed in a hydrogen atmosphere, relatively large currents can be handled. The device was tried on a 220-volt d.c. circuit, current being varied from 12 to 30 amperes. After 5 million operations the contacts showed no sign of wear. It is insensitive to changes in temperature or pressure.

New Britain
UNIVERSAL VISE

Swivels 360 degrees horizontally, 100 degrees vertically, to give any angle or compound of angles.

Write for Further Information.

NEW BRITAIN TOOL & MFG. CO.
NEW BRITAIN, CONN., U. S. A.

ACROMARK TRADEMARK **FAST**

MARKING & NUMBERING MACHINES HELP YOU DO A GOOD MARKING JOB.

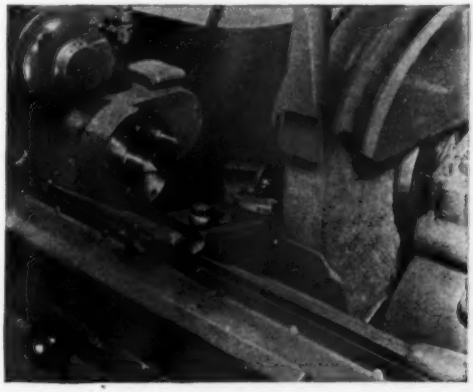
Write for latest catalog.

CONSULT OUR MARKING SPECIALISTS ABOUT ANY MARKING PROBLEM.

THE ACROMARK CORPORATION
250 No. Broad St.
Elizabeth, N. J.

Radius Wheel Truing Attachments

New radius wheel truing attachments are offered by Brown & Sharpe Mfg. Co., for use on Nos. 5, 10, 12, 20, 22 and 23 B. & S. Plain Grinding Machines.



Attachment is shown on a No. 5 Plain Grinding Machine. Knob at left clamps Attachment to table. A lever is used on other sizes.

These Attachments provide a ready means of forming wheels for grinding to shoulders where a fillet is required, and permit shaping either the right - hand or left - hand corner of the grinding wheel to any convex radius from zero to ½".

Base of the Attachment is secured to the table of the machine by a clamp, which is operated by a knob at outer end of Attachment for the No. 5 Machine, and by a lever on the other sizes. The hand-operated diamond tool holder is supported and guided by a fixed segment-shaped piece; and the segment, in turn, is mounted on a slide which is adjustable transversely in the Attachment base and is clamped in position by a screw. This transverse adjustment permits shaping the grinding wheel without changing its position when the machine is set up for grinding work of any diameter within its recommended capacity.

Figures stamped on the finished back face of the diamond tool holder show the exact radial distance from this surface to the center of the segment-shaped guide when the diamond tool holder is in operating position. Consequently, by using a micrometer or suitable gage, the diamond tool is readily adjusted to give the radius desired.

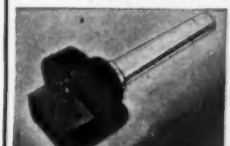
Each Attachment includes a diamond tool blank. Diamond (mounted) can be furnished at extra cost.

Weights (approx.), Attachment complete: for No. 5 machines, 2 lbs.; for Nos. 10 and 12 machines, 8 lbs.; for Nos. 20, 22 and 23 machines, 11 lbs. The Diamond tool holder is swiveled on segmented-shaped guide to true the wheel. Segment is easily relocated for shaping right-hand corner of wheel.

Rotary Shear Bulletin

The first of a series of new catalog bulletins on Quickwork equipment is announced by Quickwork-Whiting Division, Whiting Corp., Harvey, Ill. The unit, QW-100, covers only the Rotary Shear and will be followed by other sections featuring the complete line of Quickwork machinery.

New Positive Offset Boring Head Well Made, Compact



New method of adjustment by using micrometers across two hardened buttons—No chance for errors.

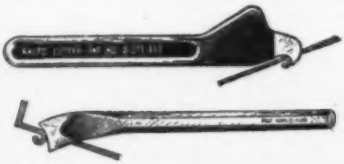
Satisfaction guaranteed.

For literature write to:

Pacific Tool Supply Co. 344 North Vermont Ave. Los Angeles, Calif.

Handy Sheet Metal Cutters

No backing is required for a piece of sheet metal in which a hole is to be



cut with the upper "Ralpo" cutter illustrated. It is made with a hook-shaped cutting point which leaves two clean edges as it cuts, curling a chip either downward as indicated or upward when held differently. It is advanced through the work by striking a shoulder on the shank located beside the cutting edge. The tool shown below is a companion unit for getting into corners where the first tool cannot reach.

The Ralpo line includes a tool suitable for use in 16-gage metal and a junior model for 22-gage or thinner. Further details on these or the corner-cutting tool may be obtained from Ralph W. Poe, Canton, Ill.

Lovejoy Cutter Catalog

Recently the Lovejoy Tool Co., Springfield, Vermont, published a new catalog covering their complete line of inserted tooth milling cutters and multiple cutter boring head, arbors, counterboring tools, turret tool parts, etc.

These tools feature an ingenious positive locking construction and permit full advantage to be gained from the use of modern carbide cutting materials.

Electrothermic-Permeation Bulletin

Complete description of Electrothermic Permeation, the new principle employed by Upton Electric Salt Bath Furnaces is described in a new 8-page folder just issued. The method of operation, which is especially suitable for the hardening of the various "Moly" high speed steels now being substituted for 18-4-1 types due to the shortage of tungsten, is available in any of the complete line of furnaces. Capacities in pounds per hour, power supply requirements, working and floor space dimensions are given for the various types of furnaces which can be used for virtually any heat treating of from 300 to 2500° F. Address Upton Electric Furnace Div., Melville Ave., at Green St., Detroit, Mich.

TO HELP YOU TEACH THE NEW GRINDER HAND

how to get maximum service from your Diamond Tools—we have some effective training material. Send for it. No obligation.

KOEBEL DIAMOND TOOL CO.
9352 Grinnell Ave., Detroit

KOEBELITE
DIAMOND TOOLS

Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for All Industrial Purposes.

Pressed Steel Dipping and Pouring Kettles.

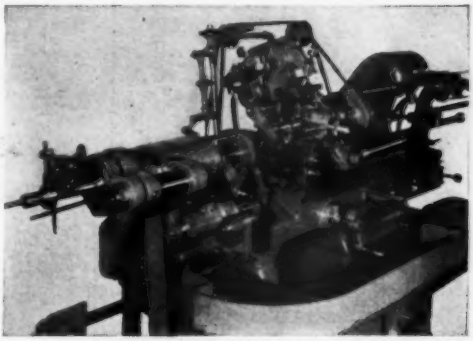
Many types and sizes—bent and straight handles—open and covered spouts.

Also manufacture ladles, skimmers, and melting kettles.

SALEM TOOL CO.
Salem Ohio, U.S.A.

Write for circular today.

American Built Swiss Type Automatic Screw Machine



An American-built Automatic Screw Machine of the Swiss type, well known for high accuracy on long pieces, is now being displayed by the Triplex Machine Tool Co., 125 Barclay St., New York City. Since 1929 this company has been acting as distributor for the Swiss Bechler Machines in the United States and Canada, and with the flow of supplies from Switzerland interrupted by the war, is now offering this American-made equivalent.

The machine has ⅜" round stock capacity and will turn 1-½" long with a flat feed cam or 2-¾" long with a bell cam. It is of the single spindle type in which the stock is fed forward through an adjustable guide bushing while it is being acted upon by radially disposed tools. The four toolslides for turning, forming and cutting off are placed immediately ahead of the guide bushing so that the overhang is at a minimum at point of cut and the same accuracy is maintained regardless of the turning length. For spot centering, drilling and right-hand threading, an attachment is provided that successively swings three cutter spindles in line with the work axis. Separate axial feed is provided for these tools. There is also available a single spindle R. H. threading attachment. In addition, a screw slotting attachment can be furished. The machine is motor driven, and spindle speeds up to 6100 r.p.m. can be obtained. The cams are of simple design and are easy to set up. The camshaft is readily accessible at the rear of the machine.

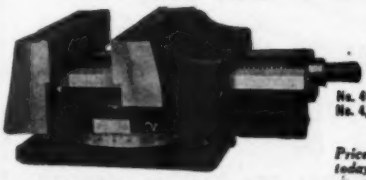
Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS

Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S.—Inexpensive—last for years.

Write for Circular

NIELSEN TOOL & DIE COMPANY
1859 Gardner Ave.
Berkley, Mich.

SUPERIOR QUALITY AND WORKMANSHIP IN PLUNKET VISES



SQUARE BASE SHAPER VISE

The Shaper Vise has graduated swivel base and tongue in center to fit slot in table, and has holes for bolting down. In ordering this vise give size of slots in Shaper Table, also distance from center to center of slots.

No. 48, 18" jaws, 2¼" deep, opens 8½". Weight 125 lbs. $52.00
No. 4, 6" jaws, 1½" deep, opens 5". Weight 45 lbs. $38.00

Our complete line includes Vises for Drill Presses, Milling Machines, Shapers and Grinders.

Prices are net, f. o. b. Chicago. Write for illustrated folder today. Dealers inquiries solicited.

J. E. Plunket Machine Co, 1823 W. Lake St. Chicago, Illinois.

Screw Machine Cams

IMMEDIATE DELIVERY

BANNER MANUFACTURING CO.
1871 Clybourn Ave. Chicago, Ill.

for TURRET LATHES

Precision

COLLET CHUCK

Drill sets to any distance. Better Grip. Faster Speed.

Greater Accuracy. Grips on 8 points instead of customary 3 or 4.

Chuck Stand supplied for any spindle—male or female. Grips on flutes as well as on Shank.

Positive Thrust Screw stop.

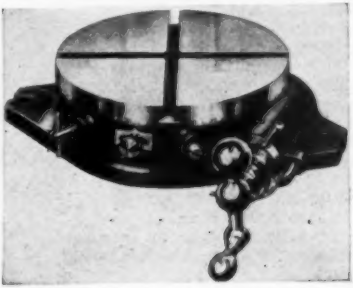
Sizes, 1/2" dia. to No. 80 Drill.

Send for New Bulletin

ERICKSON STEEL CO.
80th & BESSEMER *CLEVELAND, OHIO*

Vernon Rotary Table

Machinery Mfg. Co., 1915 E. 51st St., Vernon, Los Angeles, Cal., announce a new 7" model Vernon Rotary Table.



The low table level (only 2¾") is said to afford maximum working space; each of its 4 quadrants is graduated in degrees from 0 to 90, and its friction loaded worm dial is calibrated into 240 minutes, for instant and easy setting.

Table movement is registered against an adjustable point. Worm gear is hobbed integrally with the table, and worm may be disengaged readily to permit free wheeling of table. Positive setting is assured by a quick-setting thumb-screw type lock.

The entire unit is constructed for heavy-duty use, and the table is substantially ribbed to prevent distortion. Both table and base are ground top and bottom.

CLOSED
TRADE AUTOM MARK
CLOSED

Plain Type

Offset Type

OPEN

OPEN

CONTINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

THREE-FOURTHS OFFSET.

AUTO MOULDING & MFG. CO.
2326 S. CANAL ST
CHICAGO

SPECIFICATIONS:
Open Width 1/8" to 6"
Gage Material .040 to .125
Pin Diameter .101 to 3/8
Lengths to 120"

SEMI-OFFSET

WHY WAIT FOR DIES?

Make small runs of many kinds of metal pieces quicker—easier—cheaper—with Micro Die Substitute Machines (Bender, Brake, Shear). Get the work out—save money too! We illustrate the latest model

"MICRO DIE DUPLICATING BENDER No. 1"

A right and left hand operating unit for either right or left hand operation. Two-way direction eliminates conflicting material end when forming. 2½ times greater bearing capacity.

Write for circular **"Metal Duplicating without Dies."**

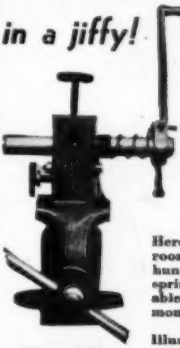
O'NEIL-IRWIN MFG. CO., 314—8th Ave. Se., Minneapolis, Minn.

Huge Lathes to Make Big Guns

A series of 16 huge lathes for machining big guns and other defense items for the U. S. Navy are now being assembled in the Pittsburgh plant of the Mackintosh-Hemphill Co. According to Colonel J. S. Ervin, President, the lathes are of the heavy duty engine type and are among the largest ever constructed.

Service in the making of big guns for the armed forces of the nation is an honored tradition to the Mackintosh-Hemphill Co., Colonel Ervin stated. "Perry won his victory on Lake Erie in 1812 with cannon and cannon balls from a Mackintosh-Hemphill plant; Mexico was subdued in 1846 with the help of Mackintosh-Hemphill guns, and during the Civil War the company produced the largest cannon the world had known up to that time. Mackintosh-Hemphill also participated in armament production during the Spanish-American and World wars and is extremely active during the present crisis."

MAKE SPRINGS *in a jiffy!* *with* Blaner Universal Hand SPRING WINDER



Here's a profitable tool room unit. Quickly makes hundreds of sizes of springs. Sturdy, dependable . . . a real time and money-saver.

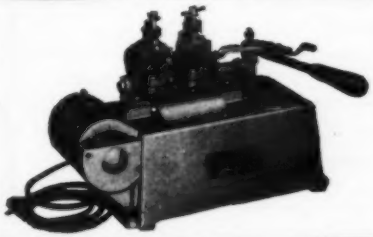
Illustrated is No. 4 Universal with adjusting shaft of 5/16" square. Takes wire up to 1/4" diam.

Patent No. 2052443

Write for your Circular.

THE JOHN BLANER CO.

Corner Meek & Elm, Sharon, Pa.



BAND SAW WELDERS

The No. 141 Bench Type Metal Working Band Saw Welder is available with or without grinder. Work can be annealed without removing from the Welder. Band saws up to ¾" wide may be welded.

1 KVA—110 Volt—60 Cycle—single phase—5 point heat control—1 point anneal heat—Weight 40 lbs. Let us send you further details.

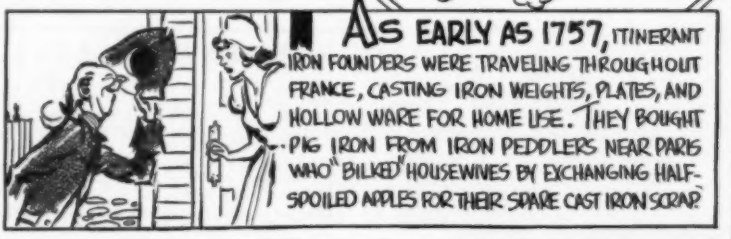
Mfrs. of complete line of Spot, Butt, Seam, Flash, Projection and Special Welders.

WELDEX INC., 7325 McDONALD AVE., DETROIT, MICH.

Mechanics Through the Ages

DURING THE MIDDLE AGES IT WAS CUSTOMARY TO "PROVE" A SUIT OF ARMOR BEFORE DELIVERING IT TO THE CUSTOMER BY SUBJECTING IT TO THE POINT-BLANK FIRE OF POWERFUL CROSSBOW BOLTS USUALLY FEATHERED WITH SPIRAL WINGS OF METAL. IF THE METAL STOOD UP, THE ARMORER STAMPED HIS "PROOF MARK" ON THE ARMOR PLATES.

TO CELEBRATE THE GRADUATION OF ONE OF HIS APPRENTICES, THE MASTER BLACKSMITH OF THE OVIMOMBUH'S OF AFRICA MAKES UP A SET OF TOOLS, KILLS A DOG WITH HIS HAMMER, SPRINKLES THE NEW TOOLS WITH ITS BLOOD—AND PRESENTS THE EQUIPMENT TO HIS EX—APPRENTICE.



AS EARLY AS 1757, ITINERANT IRON FOUNDERS WERE TRAVELING THROUGHOUT FRANCE, CASTING IRON WEIGHTS, PLATES, AND HOLLOW WARE FOR HOME USE. THEY BOUGHT PIG IRON FROM IRON PEDDLERS NEAR PARIS WHO "BILKED" HOUSEWIVES BY EXCHANGING HALF-SPOILED APPLES FOR THEIR SPARE CAST IRON SCRAP.

SPEED-UP
Riveting Operations

A great help in Defense Production, these Grant Riveters are available in Noiseless Spinning and Vibrating Hammer types also Vertical and Horizontal Multiple spindle Spinning Machines.

Information? Write!

The Grant Mfg. & Machine Co.
C. E. Station, Bridgeport, Conn.

POWER REAMING *at its* BEST

Eliminates hand reaming. Saves time and money. Improves your work. Speeds up removal of burrs from tubing as well as from bores after keyseating or drilling of set screw holes. The Catskill also saves money on finish reaming, countersinking and counterboring, smoothing off and chamfering sharp edges of round bar stock and many other finishing jobs.

Write for complete details and prices.

CATSKILL METAL WORKS
CATSKILL, NEW YORK

Hold Small Work *SECURELY* with these HANDY DRILL JIGS

Self contained and well built. Quick to change for length and diameter, for both shoulder work and gauging from the end. Chips fall away from gauging parts.

A.S.A. Standard bushings with liners to drill any size hole up to ¼" diameter. One bushing furnished with Jig. V block to center work. Can be made any form for holding special pieces. Locking handle can be reversed for either hand.

Write for full details today.

RACINE SCREW WORKS
RACINE, WISCONSIN

Blue Book Quiz Answers

(See Questions on page 165)

1—Glendale, California.
2—Grinders Abrasive Wheels and Abrasives.
3—Independent Pneumatic Tool Co., Chicago, Ill.
4—Armstrong Brothers Tool Co., Chicago, Ill.
5—1848
6—Troy, Ohio—Arc Welding Equipment.
7—Armstrong-Blum Mfg. Co., Chicago, Ill.
8—Jones & Lamson Machine Co. Springfield. Vermont.
9—The Rotor Tool Co., Cleveland, Ohio.
10—Hardinge Brothers, Inc., Elmira, N. Y.
11—Over 32,000 copies.
12—Lincoln Electric Co., Cleveland, Ohio—Arc Welding Equipment.
13—Avey Drilling Machine Co., Cincinnati Ohio—Drilling Machines.
14—R. G. Haskins Co. Chicago Ill.—Precision Tapping Equipment.
15—Unisorb Foundation Felt made by The Felters Co. Inc., Boston, Mass.
16—Mall Tool Co., Chicago, Ill.
17—Monarch Machine Tool Co., Sidney, Ohio.
18—Plants and offices in 10 cities.
19—Kearney & Trecker Corp., Milwaukee, Wis.
20—Simmons Machine Tool Corp., Albany, N. Y.—Lathes.
21—Flame Hardening Machine made by Fellows Gear Shaper Co., Springfield, Vermont.
22—Elgin Lathes made by Elgin Tool Works, Chicago, Ill.
23—Cone Vertical Threading Machine made by Cone Automatic Machine Co., Springfield, Vermont.
24—Lathe builders since 1906.
25—K. R. Wilson, 27 Lock St., Buffalo, N. Y.

Rapid Method of Graduating

To speed up defense production of timing rings, dials, graduated rings and other precision adjustment parts, a new type of steel stamping die has been developed for use in a punch press.

The dies shown were used for making dials and timing rings used on aircraft parts and lathe attachments. The die is set in a power press and the part to be stamped is centered underneath in a fixture. Each impression results in an accurately graduated and numbered part.

The marked part can be filled with black or other color enamel or paint to make the markings more pronounced. Fast methods of filling are available.

A descriptive circular and Catalog No. 52 published by The Acromark Corp., 259 North Broad St., Elizabeth, N. J., give the details.

Bradley Reorganizes

Announcement is made of the reorganization of C. C. Bradley & Son, Inc., Syracuse, N. Y., after nine years of operation under Equity Receivership.

The company was incorporated in 1832 and the first crude Bradley Hammer was built in 1872. The depression caught the Company in the midst of an expansion program and the receivership resulted.

The new officers of the company are: —Dana W. Norris, Pres., Goodwin Bradley, Vice-Pres. and Sec'y. The Company will continue the manufac-

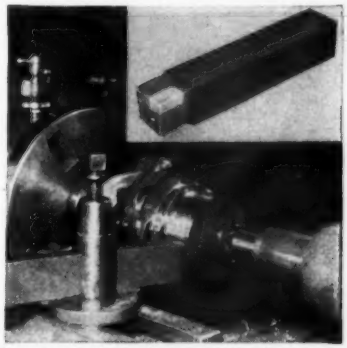
ture and sale of Bradley Forging Hammers and several new lines of manufacture will be added.

New Kennametal Grades

Improvements in their various grades of Kennametal steel-cutting tool carbides to provide greater hardness and greater strength are announced by McKenna Metals Co., 135 Lloyd Ave., Latrobe, Pa. The new hardness and strength values for the four standard grades of Kennametal are as follows:

Grade	Rockwell C	Rockwell A	Strength Trans. Rupture lbs. per sq in.	Thermal Conductivity
KM	77.6	90.8	350,000	.113
KH	78.6	91.3	275,000	.074
K3H	79.6	91.8	260,000	.068
K4H	80.6	92.3	225,000	.110

Kennametal grade KM is used widely on steel cutting jobs, in lathe and boring tools for machining alloy steel and carbon steel forgings, castings, and bar stock—for both continuous and interrupted cuts. Grade KM is exceptionally strong, enabling it to be used for shaping hard armor plate, as well as for turning and facing over interruptions as shown. This illustration shows a stack of square tool steel washers being turned round with a Style No. 3 Kennametal tool (shown in insert).



High tool strength is required to stand up under such interrupted cuts. This grade is widely used in shell turning tools, where its high strength has been

Worn Gage Blocks Can Mean Rejections

Like all tools, gage blocks wear. Some shops may be relying on gage blocks that have lost their accuracy through use and wear. DON'T TAKE A CHANCE ON REJECTIONS, particularly with the close tolerances demanded today. ORDER THE ULTRA-CHEX INSPECTOSET.

The ULTRA-CHEX INSPECTOSET consists of 34 precision length standards which will make up almost 80,000 combinations in steps of .0001" from .500" to 8".

1st: One Ten Thousandth Series—nine blocks.
.1001" .1002" .1013" .1004" .1005" .1006" .1007" .1008" .1009"

2nd: One Thousand Series—nine blocks.
.101" .102" .103" .104" .105" .106" .107" .108" .109"

3rd: Ten Thousandth Series—nine blocks.
.110" .120" .130" .140" .150" .160" .170" .180" .190"

4th: One Hundred Thousandths Series—four blocks.
.100" .200" .300" .500"

5th: Inch Series—three blocks.
1.000" 2.000" 4.000"

The INSPECTOSET also includes an Optical Flat which is used for checking gage blocks, micrometer anvils and other lapped surfaces for parallelism and planeness.

Write Today for Price and Delivery

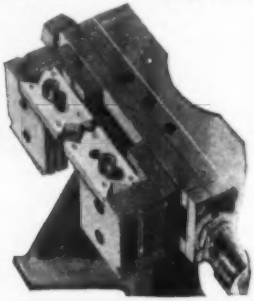
Geo. Scherr Co., Inc. 122 Lafayette St., New York, N. Y.

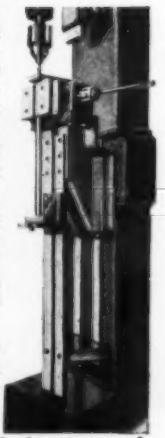
found advantageous in cutting off tools and base facing tools.

Kennametal grades KH and K3H are used on light finishing cuts or where the steel being cut is very soft, as in SAE 1010, SAE 1020, or free machining steels. Grade K4H is extremely hard and is used for precision boring of steel with light cuts.

John's Drill Jigs

These efficient production aids are available in many sizes and types for a wide range of drilling operations.





The Jigs are now provided with universal jaws for quick set-up for end drilling. The jaws are reversible and capable of gripping stock from ⅛" to ¾", depending upon the position of the V's. To illustrate, the V designated by the letter A is capable of clamping ¾" diameter while the V designated by D is intended for ⅛" and ¾".

An additional new development includes master jaws supplied with adapterjaws for quick tooling up on jobs of almost any description, inasmuch as the adapter jaws only have to be formed to fit the piece part and set up for drilling and tapping operations.

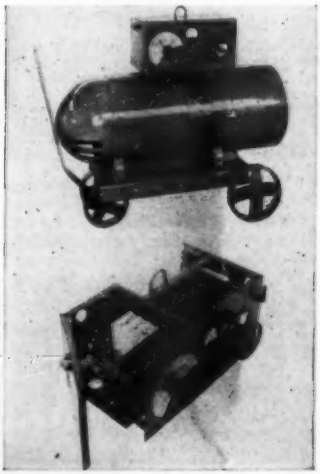
The drill jigs are now mounted by means of a special bracket right on the drill press column, thus eliminating the drill press table entirely so providing means for drilling long shafts, etc.

One of the illustrations shows a jig on a hydraulic deep hole drilling machine.

Address Heuser Mfg. Co., 1638 North Paulina St., Chicago, Ill., for bulletin describing many types of jigs.

Improved Arc Welder Control Box

Further improvement in Dual Continous Control for arc welding machines, in the form of a new welder control box of advanced design and construction, is announced by The Lincoln Electric Co., Cleveland, Ohio.



Enhancing the benefits of Dual Continuous Control, it is emphasized that the new box, designated "Type G" prevents accidental contact with live parts, increases accessibility, permits wiring with flexible or rigid conduit, or rubber-covered multiple-conductor cable and eliminates dangers from unintentional loosening of the lifting hook.

There is a separate compartment for all a. c. circuits, including push button, and another separate one for d. c. terminals.

Both a. c. and d. c. compartments have snap catches which hold the doors closed. The a. c. compartment door also has screws for locking to prevent any unauthorized person from opening the compartment and touching live parts. The catch, however, holds the door in closed position in case the screws should accidentally or temporarily be left out of their proper places. On the d. c. compartment, the snap catch feature of the door makes the terminals readily accessible without use of tools and, at the same time, provides a complete cover for terminals when door is closed.

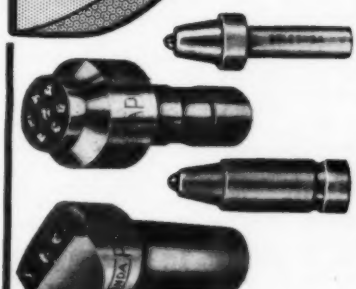
The new lifting hook eliminates risk of the hook being unscrewed unintentionally and becoming a hazard. The hook is made of round stock, bent to the form of a loop, arc welded to the sub-panel of the control box on one end and looped over a cap screw on the other. The cap screw is fastened into an angle piece which is arc welded to the frame. The new design is said to be a distinct advance over conventional eye-bolt hooks or arrangements in which a nut is welded to the top of the frame and the lifting hook threaded in to approximately the diameter of the threaded portion.

Special non-shorting lugs, which lock themselves in proper position before they can be bolted to input teminals of the starter, prevent possibility of blowing up input lines due to shorted input lugs because of careless maintenance.

The control box is permanently grounded to motor and generator frames through the mounting bolts to take care of special inspection rules which require that both the control box and the frame should be grounded. This feature makes it possible to ground both control box and machine by simply grounding the conduit which leads to the box.

An additional feature is a new lead clamp which prevents the bending or damage to output studs when welder leads are accidentally jerked or pulled.

GET TRUER-SHARPER WHEELS



Golconda Industrial Diamond Tools will enable you to get a better dressing or truing job at lower cost per dressing.

SINGLEPOINT diamond tools are available in three qualities and any type holder in all sizes. Dependable forged settings assure against diamonds working loose.

GOLCONE diamond points in 60°—90° and 120° angles have special forged settings.

Golconda also manufactures POLYPOINT tools with 3 diamonds for cylindrical and surface grinding and 7 diamonds for centerless grinding. A special alloy matrix securely holds diamonds until completely worn. Use POLYPOINT tools and cut your investment up to 75% and more.

Send your problems to us. Our more than 18 years' experience is at your disposal. Write today for literature.

Immediate delivery on standard tools.

Golconda Diamond Products Corp.

2214 W. Armitage Ave., Chicago, Illinois

No. 118 Automatic Bed-Type Milling Machine

An automatic bed-type, milling machine with hydraulic table feed, developed for high production milling of small and medium-sized parts, is offered by Van Norman Machine Tool Co., Springfield, Mass. Designated as Model No. 118, this machine incorporates many novel features including automatic table cycle. automatic spindle stop, etc.

The spindle transmission, located in a compartment at rear of bed, is driven by a 3 h.p. motor, hinge-mounted to facilitate belt adjustment to the main drive pulley. Spindle-speed changes are obtained through pick-off gears accessible in a housing at rear. Spindle drive is taken through a vertical shaft to spindle head assembly, then through large gears to spindle. Reverse to spindle is by means of a lever at left side of bed. This lever can be moved in either direction for left- or right-hand rotation of spindle. The spindle drive gears, located in a housing mounted on quill, are provided with a high-low series, selection of either range obtained through a lever which is moved up for high range and down for low range. A spindle speed plate on door of pick-off gear housing, lists gear combinations required for obtaining any of the 12 speeds from 30 to 1000 r.p.m., in geometric progression.

Spindle head slide, which forms one of the unit assemblies is mounted on heavy box-type ways, cast integral with upright column. A large handwheel, with graduated dial, is provided for raising and lowering head slide as desired. Front gib of spindle-head slide is provided with two locking screws so that head can be clamped securely in place.

Hydraulic mechanism for operation of table comprises a pump and main control panel, together with necessary valves, all of which are located in a compartment at front of machine. Drive for hydraulic pump is taken from front end of main drive shaft of spindle transmission.

Hydraulic feed cylinder is mounted on bed directly under table and has its pipe connections made through bed at main operating panel. Table dogs for automatic control of main operating panel are located at front of table and are easily adjusted as desired.

Main operating panel has a control lever located at right side which can be set manually to any one of four positions; neutral, rapid advance, feed and return. The Vari-Throttle valve for setting table feed rate, located at left of this lever, is adjusted by means of a knurled dial. This dial is provided with a lock so that the predetermined feed rate setting can be permanently locked.

Spindle clutch in the spindle transmission compartment is operated hydraulically by means of a clutch lever located in a panel at right front side of machine. Engagement of this lever instantly stops or starts spindle. The machine, however, can be provided with an automatic spindle stop which provides for automatic engagement and dis-engagement of spindle in relation to travel of table. With this feature, it is possible to start spindle automatically when main operating lever is

thrown to rapid advance position, and spindle automatically stops when table is reversed.

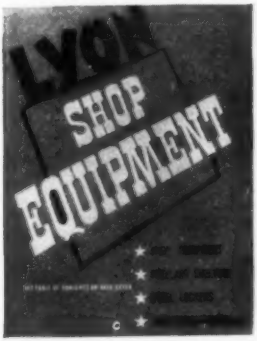
Normal cycle of machine is rapid-traverse advance, normal milling feed, then an automatic rapid-traverse return to starting position. By means of additional table dogs, however, it is possible to obtain skip-stop table cycles.

Working surface of table is 34"x10"; Longitudinal power feed of table is 18". Table feed range, ½" to 40" per minute. Rapid traverse, 200" per minute. Vertical movement of spindle head slide; 7½" with a minimum of 2¾" from top of table to center line of spindle. The quill has 3½" of cross adjustment, with a minimum of 3" from the center line of the table to face of spindle. Machine occupies a floor space of 65"x46". Total height 61". Weight is 3600 lbs.

Shop Equipment Catalog

Of special interest to manufacturers and jobbers is a 40-page comprehensively illustrated catalog on Steel Shop Equipment products.

It illustrates many items such as work benches, stools, stock and tool carts, tool cribs, cabinets and numerous special purpose products.



A large number of new items including arc and gas welding benches, sheet metal worker's bench, two and three shift drawer inserts and other products are shown.

Send requests for catalog 331-D to Lyon Metal Products, Inc., 3042 Clark St., Aurora, Ill.

MILFORD

PROFILE SAW

. . . for all contour-sawing, jig and band saw machines.

A MACHINE equipped with Milford Profile Saw becomes a most versatile metal-working tool. It will cut complicated shapes, either internal or external, in any machinable substance, and do it in many cases at an amazing cost saving over conventional methods.

Since Milford originated this type of saw in 1886, many specialized "contour-sawing" machines have been developed to use it, **but any good vertical band saw machine with fixtures will do yeoman service.** The saw does the cutting, not the machine.

Under pressure of all-out production, many a shop over the country is using Milford Profile Saw, in jig or band saw machine, to relieve its basic machine tools — drill presses, milling machines, shapers, slotters, lathes, jig borers, etc.

Look into this in your shop, but remember: a machine for contour sawing is no better than its saw. Milford Profile Saw is made by the world's largest, most experienced producer of metal-cutting band saw. Carried in stock by all Mill Supply distributors.

WRITE FOR FREE SAMPLE, GIVING SPECIFICATIONS OF BLADE YOU NOW USE, OR DESCRIPTION OF CUTTING JOB, AND MAKE OF YOUR MACHINE

THE HENRY G. THOMPSON & SON CO., NEW HAVEN, CONN.

MILFORD
PROFILE SAW
REZISTOR HACKSAW BLADES

GOOD NEWS!

for DIE MAKERS

Transfer Points Eliminate Guesswork in Die Making

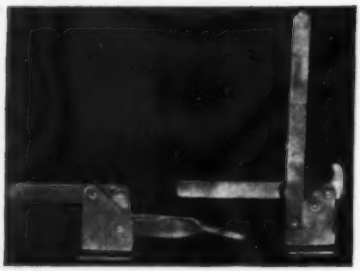
There's no chance for error when you use transfer screws as markers in setting dies. Points are of uniform height above hex base. Six accurately made and hardened screws nest in a special holder with hex wrench tip. Made in ¼" to 1" diameters.

3/16"	$1.50 per set	5/16"	$1.25 per set	7/16"	$1.40 per set
1/4"	1.20 " "	3/8"	1.35 " "	1/2"	1.50 " "

HEIMANN MFG. CO., URBANA, OHIO

"Peco" Quick-Acting Clamps

A new line of quick-acting clamps is announced by Products Engineering Co., Los Angeles, Cal.



This complete line of clamps is claimed to be adaptable to practically all manufacturing, tooling and fabrication requirements at a cost far below that of individually designed equipment.

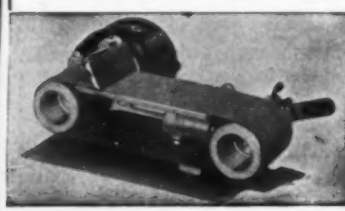
According to the manufacturers, the clamps are designed by manufacturing engineers for application on jigs and fixtures in a large variety of ways.

The present line includes quick-acting Drill Clamps, Jig Draw Clamps, Knife Clamps, Toggle Clamps and Jig Cam Clamps. They are constructed of combinations of hot rolled and cold rolled steel, and rivets and rollers are heat treated for strength and long wear.

Switzerland Also Delivers the Goods

Grobet File Corp. of America announce that during the month of May the Swiss-chartered boat, Jurko-Topic, arrived safely in New York with a huge shipment of Grobet Swiss Files. They also received during the months of June and July a large shipment on an American boat, and further shipments are expected in the near future.

AN INEXPENSIVE ABRASIVE BAND GRINDER



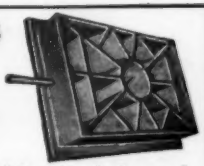
"Built Like A Machine Tool"

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on belt. Ball bearing throughout, equipped with Alemite lubrication, complete with grease gun.

Write for illustrated folder on this and other styles and sizes.

WALLS SALES CORP.
96 Warren St., New York, N. Y.

ACCURATE, RIGID SURFACE PLATES



These particular surface plates are made of a high quality of close-grained, stress annealed semi-steel type grey iron. Of extra rigid construction, they have a three point suspension and are designed for a minimum flexion with a high degree of precision and are adapted for use where extreme accuracy is required. They are manufactured in several sizes and deliveries are prompt. Write for full details.

LOMBARD GOVERNOR CORPORATION, Ashland, Mass.

Munitions Engraver Bulletin

A new bulletin No. 1635 describing the Model M-E Munitions Engraver has just been published by the George Gorton Machine Co., Racine, Wis.

This 4-page booklet, together with an insert, gives the machine specifications, samples of work with production times, accessories, assembly and lubrication charts, and an actual size work chart for selecting the right machine.

SPEED DEFENSE WORK
By Using

Elgin AC Electric Arc Welders — Constructed for ease and efficiency of operation; built for long and hard service—truly, "up - to - the - minute" welders.

B O R M
Manufacturing Co.
ELGIN, ILLINOIS

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Don't let slow, expensive hand finishing and the scarcity of skilled labor tie up production. Whether or not it's a defense contract, it's speed you want—and it's speed you get with the Easy Electric Sander. One inexperienced man, with the Easy, can do the work three times faster and cut time, labor and abrasive costs up to 80%. That's why industry's leaders are using the EASY for every finishing application on metal, wood, plastic, composition and other surfaces.

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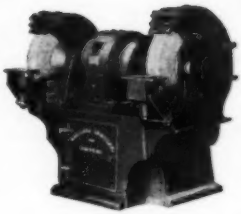
DETROIT SURFACING MACHINE COMPANY
7432 West Davison **Detroit, Michigan**

THE MARSCHKE LINE

YOUR GRINDING COSTS

You want the fastest metal removal per hour, at the lowest possible abrasive wheel cost. These requirements call for the controlled wheel speeds and the smooth wheel rotation for which long-life Marschke Grinders are noted.



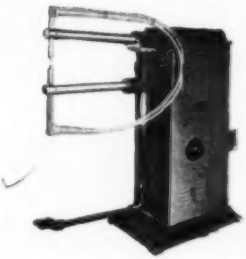
Whether you need a floor stand or a swing frame grinder . . . whether it be equipped with a 1 HP or a 25 HP motor . . . there is a quality Marschke for your particular requirements *and Marschkes will do your grinding at the lowest possible cost.* See the proof —write today for the Marschke Catalog, to

VONNEGUT MOULDER CORP., 1805 Madison Ave., Indianapolis, Ind.

HEAVY DUTY REX SPOT WELDERS

HERE IT IS

PROMPT DELIVERIES



At surprisingly low cost—The REX All Automatic Butt Welding Attachment.

For quick conversion of the REX or other spot welders of the rocker arm type—

Write for details and price.

The REX Spot Welders self contained steel cabinet units — Adjustable - swivel lower arm—Upper arm adjustable in and out.

Foot—air or motor operated—Rocker arm and press type design. 10 models.

Underwriters' approved.

Write for bulletin and price list

Dyer WELDER AND ENGINEERING Company

7 East 19th Street, Kansas City, Mo.

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Lists of Used and Rebuilt Machinery, either For Sale, Wanted, or For Exchange, set in uniform style, will be published in the Classified Section at the rate of $5.00 for your name and address and a five line advertisement. For additional lines, 40c per line.

Write directly to those offering the machine for sale, **for prices and full descriptions. If what you seek is not advertised, write Hitchcock Publishing Company, Chicago, making known your wants on either new or used machinery and the publisher will gladly pass them along to the advertisers.**

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Aaron Machinery Co.,
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National-Acmes No. 53, 55, 56, m.d., 76 4 spdl. autos.
Gridley, Model F, 4 spindle, 1".
Gridley, single spindle, 3½".
Borer, Rockford 2" horizontal.
Drills, radial, 3' Morris, 2½', 4' Mueller, m.d.
Eyeletting machines, United Shoe, Model B.
Gear hobbers, G. & E. and Shuchardt & Schutte, b.c.
Grinders Brown & Sharpe No. 1, 2, 13 universal.
Grinders, Bryant No. 6 internal.
Grinders, No. 55, 60, 65, Heald internal.
Hammers, Pettingell trip, No. 1, 2.
Lathe, 14"x8' Lodge & Shipley, grd. bd., 12 speed.
Lathe, 21x8' LeBlond, 3 step cone, heavy.
Lathe, Hendey 24x8', 9 speed, geared head.
Lathe, Hendey, yoke, 14", 18", 20".
Lathe, 24x10' Wickes Bros., q.c., 3 step cone, heavy
Lathe, 24x10' Crawford, 3 step cone, heavy.
Lathe, 24x10' Reed-Prentice, grd. head, m.d.
Lathe, 24"x14' Reed-Prentice, geared head.
Lathe, Pond 39x21'
Lathe, 18-36"x7'-10' Fay Scott, sliding bed gap.
21" Gisholt, 3½" hollow spindle.
Hardons & Oliver No. 2, 4.
Steinle 24", Universal, 6½", h.s., m.d.
Pratt & Whitney 2½x26" grd. head, s.p.d.
Miller, Cincinnati No. 4 plain.
Miller, Cleveland No. 1 plain, s.p.d.
Millers, B. & S., Cincinnati No. 2, 3.
Millers, Brown & Sharpe No. 13 production.
Miller, Cincinnati No. 3 Universal.
Miller, Jackson vertical, No. 10.
Shaper, Ohio 16", s.t.d.
Shapers, crank, 14", 16", 20", 26".
26" Libby, 7½" hole.
Turret lathes, Foster No. 7, (10).

Nelson Machinery Co., Green Bay, Wis.

Brake, Keene 10' Cornice, No. 114.
Compressor, LeRoy Model 2S, size 315 CFM, direct m.d., 75 h.p., 3-60-220/440-860 RPM.
Drill, 28" Barnes, sliding hd., H.W.L.&G. p.f., bd.
Lathe, 14"x8' L. & S., q. c., 56" centers, s. b. g.
Lathe, 16"x10', Rockwell, l. c., 78" centers, d. b. g.
Lathe, 20x12' American, s.b.g., l.c., belted.
Lathe, 22"x10' Schumacher, Boye, l. c., 72" cent., s.b.g.
Planer, American, 28x28x8', one head, belted.
Planer, Ohio, 36x36x8', 2 heads, belted.
Punch, Reade, 36" throat, plain, m.d.
Shear, No. 2 Lennox bevel, capacity ½".

FOR SALE BY

Siegman Machinery Co., Inc.
561 W. Washington Blvd., Chicago, Ill.

Chip separator, 1 bu., motor drive, less motor.
Gear generator, 5A 14" Lees Bradner.
Generator, 18" straight tooth, Gleason.
Grinder, Greenfield hydraulic, No. 1—6"x18".
Grinder, rotary, Arter 8".
Grinder, tool & cutter, Cincinnati No. 1.
Grinder, tool & cutter, Wilmarth & Morman, No. 1.
Grinder, Bryant No. 10A.
Lathe, 15x6 Reed Prentice, grd. hd., m. d., t. a.
Lathes, Lodge & Shipley, 16x8, q c.g.
Lathe, 26"x12' Schumacher-Boye, quick change.
Profiler, single spindle, No. 4 Garvin.
Radial drill, American 3'.
Radial drill, Bickford 3½' m. d.
Shaper, 20" Rockford, m. d.
Thread cutter, Coulter auto. 6' g. h. 4"x24" s.p.d.
Please send us your inquiries.

Lloyd Machinery Inc.
150 Broadway New York, N. Y.

Boring mill, 42" Gisholt, 2 heads, m.d., rap. power tr.
Gear generator, 11" Gleason, auto. bevel, s.p.d.
Grinder, 84" Diamond, wheel diam. 30", m.d.
Lathe, turret 18" Libby Model A, s. p. d.
Planer, 60"x60"x10' Cincinnati, dbl. std., 3 hds., m.d.
Slotter, 24" Newton, table diam. 42", m.d.

Globe Machinery Co.
602 W. Lake St., - - - Chicago, Ill.

GUN DRILLS

2 Pratt & Whitney & 4 Bausch, 2 spindle horiz. 1" & 1½" cap, size 13x9'8" bed, swing 7".
Boring bar, 3", Beaman & Smith horiz., floor type, gear box, motor drive.
Broach, LaPointe-Hudson No. 3, m. d , cut keyways to 1½", bro. sq. holes to 3½" across flats, 54" stroke
Lathe, Johnson, 21"x14', gd. hd., 2 steady rests, face plate, arr. m.d.
Lathe, Fitchburg 3½"x60" low swing, gd hd., 2 carr.
Lathe, 20"x10' Whitcomb-B., gd. hd., m.d., complete.
Lathe, Harrington 48" gap, 15' between centers when bed is open.
Pipe threading machine, cap. 2" to 8" arr. m. d., including 8 dies, cutting-off attach. & oil pump.
Planer, 26"x26"x6' Hamilton, 1 head on cross rail.
Planer, 34"x36"x16', 4" bed, Gray, 2 hds. on rail.
Wire straightener & cutt. mach., cap. ⅛-3/16-3' cut-off.

USED AND REBUILT MACHINERY

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3221 Olive St. - - St. Louis, Mo.

Lathes, bench, precision, ⅜", ½" & ⅝" collet cap.
Lathe, 13"x6' Davis, semi-q.c.g.
Lathe, 14"x6' Hamilton, semi-q.c.g., tool room acc.
Lathe, 14"x8' Fay & Scott, q.c.g., gap bed, m.d.
Lathe, 18"x8' American, 12 speed geared head, m.d.
Milling machine, No. 3A Brown & Sharpe, s.p.d.
Shaper, 24" Gould & Eberhardt.
Shapers, 16", 20" Ohio.
Testing machine, Rockwell, No. 8H-40.
Turret lathes and screw machines, ⅜", ½", 1" and 1¼" bar feed capacities.

Austin D. Lucas and Co.
358 Bishop Ave., Bridgeport, Conn.

Automatic screw machines, 2" Cleveland, s. a., magazine fd., air cyl., dbl. crosslide Model A machs., (4).
Automatic screw machine, 1½" Cleveland, s. a. bar equipped, dbl. crosslide.
Lapping machine, 30" Norton, chain motor drive with motor. New 1930.
Milling machine, No. 4 Ohio pl., d.b.g., tab. 72"x13½".

Standard Machinery Co.,
347 Indiana Ave. Grand Rapids, Mich

Automatic, ⅝" Cleveland, single spindle.
Drill, 40" New Haven No. 5, sliding head.
Extractor, DeLaval, size No. 26.
Gear cutters, Whiton No. 14 automatic, (2).
Grinder, cylinder, Heald No. 65.
Lathe, 24"x8' Lodge & Shipley, q.c.g.
Lathe, 2"x24" Jones & Lamson, flat turret.
Miller, Becker No. 2 vertical.
Tapper, Anderson No. 40 Dial Feed Auto.
Welder, Expert Portable spot, 50 KVA.
Welder, Thompson Spot 25 KW, foot operated.

Jones Machine Tool Company
Front & Pike Sts., Cincinnati, Ohio

LATHES

16"x8' Lodge Ship., q.c.
18"x8' Mueller, q. c.
18"x10' Monarch, q. c.
20"x10' Hamilton, q. c.
26"x12' Bridge'd, q.c.
30"x14' American, q. c.
No. 7 B.&O., hex. turret.
24" Gisholt, hex. turret.
28"x14' Boye & E., c. d.
36"x16' Pittsburgh, c. d.
32"x14' Amer., c. d.
No. 4 W. & S. turret.
Acme 14" turret lathe.
14" Pratt & W. turret.
24"x10' L. & S., q. c. with hex. turret on ways.

MILLERS & SHAPERS

No. 3 LeBlond Uni. c.d.
No. 3½ Fox plain, c. d.
20" Smith & Mills, b.g.d.
24" Cin'ti sgl. pul. drive.

PLANERS

36"x16' Put., 1 rl., 1 s. h.
32"x12' N. Haven, 1 hd.
40"x12' N. Haven, 2 hds.
36"x14' Bed., o. s., Stone.

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No. 76 Toledo b. g.
No. 20C Bliss, O. B. Inc.
No. 2 R. & K. O. B. Inc.
No. 5-A Willard o. b. inc.
No. 160 Consolidated, d.c.
No. 25 Niagara, arch.
No. 15 Toledo, dp. throat.
No. 41A Toledo, horn
No. 33 Toledo, bk. gd.
Wickes 26" tht. punch arch jaw.
150 ton Fireston, ver. hyd.

MISCELLANEOUS

4' Foadick, rad., box. col.
18" Gleason gear gener.
36" & 48" B&S gear cuts.
Style F. Baker h.d. drills,
60"x14 ga. Bertsch shear.
15-20-40 KW spot welds.
2" Acme bolt cutter.
No 4 M&M keyseater.
12x12 Racine hack saw.
100 used lathe chucks.
Lathe dogs, tool holders, vises, etc.

ONLY A FEW—LET US KNOW YOUR WANTS

FOR SALE BY

Factory & Mill Supply Co., Inc.
176 Federal St., - Boston, Mass.

Milling machine, No. 2-M Potter & Johnson, auto.
Planer, 48"x48"x12' Betts, 3 heads, m.d.
Planer, 60"x60"x12' Pond, 2 heads, m.d.

D. E. Dony Machinery Co.
47 Laurelton Rd., - Rochester, N. Y.

Boring mill, 42" Colburn.
Drill, 4-spindle, Demco 12" overhang.
Gas cutting machine, No. 7 Oxygraph.
Press, No. 73½ Bliss, s. s. geared.

Sterling Machinery Corporation
411 Southwest Blvd., Kansas City, Mo.

Grinder, Heald No. 60, internal grinder.
Lathe, Potter & Johnson No. 5A turret lathe.
Motors, electric, used, various sizes, both AC & DC.
Prices and specifications on above items furnished upon request.

C. R. Daniels
1514 W. Capitol Drive, Milwaukee, Wis.

Band saw, No. 3 Atkins metal cutting.
Die filing machine. Thiele.
Grinder, No. 65 Heald internal.
Lathe, 24"x12' Lodge & Shipley, q. c. g.
Slab miller, 24"x11' Beaman & Smith.

S. M. Regar Machinery and Mill Supplies
Tampa, - - - - Florida

Cyl. grinder, Modern Tool Co., 8x30 self contained.
Grinder, Brown & Sharpe No. 3.
Grinder, Brown & Sharpe No. 11.
Grinder, Wilmarth & Morman No. 1.
Grinder, Cincinnati No. 1½.
Grinder, Bridgeport surface, 26" wheel.
Grinder, Springfield, double end, heavy duty fdry.

Davis Machinery Company
1-3-5 St. Clair St. Toledo, Ohio

Brake, 8'x3/16" Dreis & Krump, power leaf type.
Drill, No. 2-B Ealund, 4 spdl. H. S., B. B., motor dr.
Drill, 36" Rockford, b. g. & p. f., motor dr.
Filer, No. 3 Thiel, filing & sawing, m.d.
Gear cutter, 48"x12" Gould & Eberhardt, s.p.d.
Gear cutter, No. 3-36 Brown & Sharpe, s.p.d.
Keyseaters, No. 0 and No. 2 Baker.
Keyseater, No. 2 Mitts & Merrill.
Lathe, 32"x25½' Gleason, st. c. gear.
Lathe, 14x6' American, q.c g., gd. hd., m.d.
Lathe, 19"x8' LeBlond, hy. duty, q.c.g., c.p.
Mill, No. 4 Cincinnati high power, plain.
Mill, No. 3 Cincinnati, plain, b. d.
Mill, No. 2 Hendey Norton plain, cone drive.
Nibbler, No. 103 Gray, cap. 1/8" throat, 30".
Planer, 22"x22"x8' Gray, one head, b.d.
Press, No. 90-D Toledo, dbl. crank, m.d.
Shaper, 7" Rhodes, vert. & horiz. heads.
Shaper, 16" Newark, b.g. crank, s.p.d.
Shear, 10'x1/4" Bertsch sq., motor drive.
Turret lathe, No. 5 Foster, power feed.
Turret lathe, No. 7 Foster, power feeds.

USED AND REBUILT MACHINERY

FOR SALE BY

Lang Machinery Company **28th St. & A. V. R. R.** **Pittsburgh, Pa.**

Air compressors, Ingersoll-Rand XB-2, 600, 866, 1200 & 1500 cu. ft. 100 lb. pressure, motor drive.
Air comp. 14"x12" Ing. Rand "ER-1", 464 c. f., m. d.
Bolt cutter, 1" Landis, 14"-3" sgl. hd., b. d.
Bolt cutters, 1" Acme, Landis hds., 2 & 3 spdl.
Boring mill, 36" Bridgeport, grd. feeds, m. d.
Boring mill, 42" Bullard, 2 swivel heads, b. d.
Boring mill, 8' Betts, 2 hds., grd. feeds, b.d.
Boring mill, horiz. 3½" bar N-B-P, knee type, b. d.
Boring mill, horiz. 3½" bar D & H, floor type.
Boring mill, horiz. 5" bar Barrett, b.d.
Brake, 8'x12 gauge D & K leaf type, s.p.d.
Bulldozers, No. 2 & No. 4 Wms. & White, m.d.
Column facer, 30" dia. Espen Lucas, b.d.
Drill, 2-spindle Woodward-Rogers, m. d.
Drill, mult. No. 3 Rockford 3 spdl., s.p.d.
Drill, mult. 10 spindle D-12 Fox, b. d.
Drill pointer, Sellers, m. d.
Drill, radial, 24" Prentice, t. a., b. d.
Drill, radial, 3' Bickford, t. a., m. d.
Drills, upright, 11" to 34", b. d. & m. d.
Gear cutter, spur, 30"x16", B. & E., m. d.
Gear cutter, spur, 84" Newark, m. d.
Gear planer, 54" Gleason, bevel, m. d.
Generator, 100 KW Westinghouse d. c., 125 v. b. d.
Generator, 150 KW Jeffrey, d. c. 250 v. b. d.
Grinder, disc, 10" Diamond, dbl. end.
Grinder, dbl. end, Standard Elec. 7½ H. P. 220 v. d. c.
Grinder, gear tooth, Detroit No. D-12, m. d.
Grinder, internal cylinder, No. 5 Landis, b. d.
Grinder, tool & cutter, Ingersoll inserted tooth, m.d.
Grinder, univ., No. 5 B. & S., 20"x72", b. d.
Grinder, No. 60 Heald, b. d.
Hammer, power, No. 2-B Nazel, m. d.
Hammer, power, 300-lb. Bradley, upright helve.
Hammer, power, No. 4 Beaudry, b. d.
Hammer, 1500 lb. Bliss, board drop, b.d.
Hammers, steam drop, 400-lb. to 8000-lbs.
Hammers, steam forging, 800 lbs.—6000 lbs.
Keyseater, No. 24 Baker, 24", m. d.
Lathe, 12"x6' Smith, semi-q. c. g., d. b. g., b. d.
Lathe, 14"x6' Rockford, semi-q. c. g., d. b. g., b. d.
Lathe, 15"x10' Sebastian, p. c. g., s. b. g., b. d.
Lathe, 15"—24"x8' Sebastian grd. head, m. d.
Lathe, 16"x8' Pratt-Whitney, p. c. g., b. d.
Lathe, 16"x10' Bradford, grd. head, q. c. g., m. d.
Lathe, 16"x24"x8' So. Bend, gap, b.d.
Lathe, 17"x6' LeBlond, automobile, b. d.
Lathe, 17"x8' LeBlond, q.c.g., d.b.g., b. d.
Lathe, 18"x6' American, q. c. g., d. b. g., t. a., b. d.
Lathe, 18"x6' Prentice, p. c. g., t. a., b. d.
Lathe, 18"x8' Carroll, d. b. g., q. c. g., b. d.
Lathe, 18"x8' Prentice turning, d. b. g., p. c. g., b. d.
Lathe, 18"x10' Hervey, q. c. g., b. d.
Lathe, 20"x8' American grd. hd., q.c.g., m.d.
Lathe, 20"x10' Hamilton g. d. head, q. c. g., a. p. d.
Lathe, 24"x12' American grd. head, m.d.
Lathes, 26"x11' Wickes hvy. duty comb. Eng. & Tur.
Lathe, 27"x11' LeBlond, grd. hd., q.c.g., d.b.g., m.d.
Lathe, 27"x12' Putnam, hvy. duty, q. c. g., d.b.g., b. d.
Lathe, 27"x18' Sidney, d.b.g., q.c.g., b.d.
Lathe, 32"x16' Schumacher & Boye, p.c.g., d.b.g., b.d.
Lathe, 36"x18' American, p. c. g., t. a., b. d.
Lathe, 36"x26'6" New Haven, p. c. g., b. d.
Lathe, 36"x45' N-B-P turning, grd. head, m. d.
Lathe, 42"x 20' Springfield trip. grd., p. c. g. b. d.
Lathe, 44"x 12'7" Pond, triple grd., p. c. g., b.d.
Lathe, 48"x22½" Johnson, trip. gd. int. face pl. dr. b.d.
Lathe, 48"x26½" Johnson, trip. gd. int. face pl. dr. b.d.
Lathe, 60"x20' Niles, b. gb.d.
Lathe, gun boring, 2 bar, cap. hole 12"x40', m. d.
Lathe, turret, 16" Warner-Swasey, h.s. 1 7/16", b.d.
Lathe, turret, 18" Reed, h.s., 1½", p. f., b. d.
Lathe, turret, 18" Libby "A", h.s. 2-9/16", m.d.
Lathe, turret, 26" Libby "C", h.s. 7¼", s.p.d.
Leveller, 84" Bertsch 7 rolls, m. d.
Leveller, plate, 48" McKay, 17-roll, m. d.
Miller, hand, No. 3 Rockford, table, 18"x4½".
Miller, plain, No. 2-A Milw. tbl. 48"x12", s. p. d.
Miller, plain, No. 5-C Becker-B., tbl. 66"x16", b. d.
Miller, univ. No. 3 Cin. tbl. 46"x9½", b. d.
Miller, slab, 30"x24"x12" Ingersoll, adj. rail, m.d.
Miller, Vert. Taylor & Fenn, tbl. 30½"x6", m. d.
Miller, vertical Niles, table 42" dia. b. d.
Pickling machine, Mesta, 8-12" arms.
Pipe machines, Landis ½" to 2", belt drive, (2).
Pipe machines, 8" Williams, 2½" to 8" motor drive.
Planer, 24"x24"x8' Lodge-Davis, 1 head, b. d.
Planer, 24"x24"x5' New Haven, 1 head, b.d.
Planer, 30"x30"x8' Cincinnati., 2 heads, m.d.
Planer, 36"x36"x10' American, 2 heads, m. d.
Planer, 36"x36"x11' Sellers, 2 heads, rev.-m. d.
Planer, 36"x36"x14' Gray, 4 heads, b.d.
Planer, 48"x48"x30' Putnam, 3 heads, m. d.
Planer, 54"x54"x20' Pond, m. d.
Press, double acting, No. 1 Bliss, roller feed,
Press, hydraulic, 100 ton, Watson-Stillman, m. d.
Press, forging, 1500 ton Farrell-Birmingham, m.d.
Press, o. b. g. No. 68-C Bliss, stroke 5".
Press, perforating, No. 5 V & O, str. 4", dbl. crk., b.d.
Press, straightening, Hunt hydraulic, 50 tons.
Profiler, No. E3, Keller, motor drive.
Punch, lever, No. 58 Niagara, 36" throat.
Punch, mult. 10' L & A, cap. 340 tons.
Punch & shear, No. 3 L & A, rap. act. 1"-1".
Punch & shear, Cleveland EF, 1¼" thru 1", m. d.
Punch & shear, Cleveland "G", 2" thru 1", m. d.
Punch & shear, dbl. end. No. 00 Covington, 2"-1", m.d.
Saw, band Type JM Laidlaw, cap. 6", m. d.
Saw, band 28" Crescent, tilting tbl. 20"x24", b. d.
Saws, hack, 4"x4", 6"x6", 9"x9", 12"x12", b. d. & m. d.
Saw, cold, Espen Lucas, blade 22", cap. 6" rd.
Screw machine, No. 1 W. & S., cap. ⅜", b. d.
Shaper, draw-cut 42" Morton, m. d.
Shaper, 24" Cincinnati, m.d.
Shear, allig. Pittsburgh, cap. 2"-2½", m. d.
Shear, allig. No. 7 United, 6" square, m. d.
Shear, alligator, No. 61 Carlin, 3" round high knife.
Shear, bar, Mesta 36"x1¼", m. d.
Shear, circle, No. 05 Niagara, b. d
Shear, flying, Edwards, capacity 10 sq. in.
Shear, plate, 72"x1¼" United, m. d.
Shear, plate, 119"x1" Wheeling, gap. 15", m.d.
Shear, plate, 10"x¾" Pittsburgh, gap, 15½", m. d.
Shear, plate, 125"x3/16" Hyde Park, gap 15", m.d.
Shear, plate 156"x3/16 Hyde Park, gap 17", m. d. (2)
Shear, plate 156"x3/16" Standard, gap 15", m.d.
Shear, plate, 96"x1¼" Morgan, m.d.
Shear, plate, 132"x1¼" Morgan, m.d.
Shear, squaring, 60"x16 ga. Pexto, m.d.
Shear, squaring, 72"x16 ga. Streine, m.d.
Shear, rot. No. 10-M Marshalltown throatless, 10 ga.
Slotter, 18" Bement, table 36" b. d.
Slotter, traveling, Morton, stroke 84", m.d.
Sprue Cutter, No. 7 Z & H, cap. 50 tons.
Vertical attachments, Nos. 1, 3, 4 an 5 millers.
Straight'ner, strip, & cut. No. 1 Schuster, 2½"x¼", m.d.
Straight'ner, shape, No. 3 Sutton, 2-way, cap. 2½", m.d
Tapping machine, duplex Garvin 2-X, ½"-1", b.d.
Thread Miller Smalley General, cap. 14"x3", m.d.
Welders, 150 amps. and 200 amps, portable.

USED AND REBUILT MACHINERY

FOR SALE BY

Wisconsin Gear & Engineering Co., Inc.
602 So. 2nd Street, - Milwaukee, Wis.

Gear generators, Bilgram bevel, 6" & 16", guaranteed to be in A-1 condition with all change gears and segments.

Fuchs Machinery & Supply Co.
1102-4 Farnam St., Omaha, Nebraska

Broach, No. 1 LaPoint, b.d.
Drill, 2 spdl., Henry Wright, 15" overhang, prod. table.
Drill, 3' American rad., s.p.d.
Drill, Barnes 4 spdl., 20" with individual belted m.d., each spindle, 220-3-60.
Grinder, Micro internal cylinder, m d.
Grinder, pedestal, 7½ h.p., U.S.B.B.
Hammers, 50 & 100 lb. Little Giant.
Lathe, 20x10 American, d.b.g., q.c.
Lathe, 16x8 South Bend, l.c.
Lathe, 20x10 Monarch, geared head, m.d.
Nibbler, No. 1 Campbell 3/16, pedestal, b.d.
Press, No. 54 DAG Ferracute, d.a. cam.
Punch & shear, No. 3A Royersford dbl. end shears 8x¾. Punches 1" th. ough ¾.
Roll, 5'4" diam., belt drive.
Saw, 6x6 Peerless, b.d.
Saw, 9x9 Peerless hack, m.d.
Shaper, 16" Rockford, cone drive.
Shear, No. 2 Kyerson serpentine, m.d.
Shear, ½" Kling rotary splitting.
Slotter, 16" Putnam, 27" table.

Wm. C. Johnson & Sons Machy. Co.
1211 Hadley St., St. Louis, Mo.

Air compressors, 15 in stock.
Bolt threaders, 1", 1½" & 2" Acme.
Boring mill, Niles, 8-ft.
Brake, press, L&N, 10', 10 ga.
Drill, Natco 13 spindle, No. 1 taper.
Drill, No. 2 Fox, 6 spindles.
Drills, radial, Dreses, 3' & 4'.
Drills, radial, Foodick, 3'.
Drills, radial, Drillmaster, new.
Forging machine, Ajax 2".
Grinders, 10"x30" Landis.
Grinder, Walker 12" rotary.
Hammers, 300 lb. Beaudry, 75 lb. Bradley, 50 & 100 lb. Little Giant.
Lathes, 14"x6' Monarch, q.c.g.
Lathes, 14"x6' American, q.c.g.
Lathe, 18"x8' Amer. q. c. g.
Lathes, 20x8' Le Blond, q.c.g.
Lathes, 24x16' Lodge & Shipley, q.c.g.
Lathes, 36—48x18' McCabe 2 spindle.
Lathe, 32"x14' Schumacher & Boye.
Lathes, 80x14 New Haven.
Lathes, 82" Niles locomotive wheel.
Miller, No. 3 Knight vertical.
Miller, No. 0 Steptoe.
Miller, No 3½ Fox.
Pipe machines, 2"—4"—6"—8"—12".
Pipe machine, 2" Landis.
Planer, Cincinnati 2 heads, m. d.
Potter & Johnson 5 A auto.
Press, wheel, 400 ton 84" Niles.
Press, wheel, 200 ton 48" Niles.
Punches, shears, bulldozers.
Roll, plate straightening, H. & J. No. 2, like new.
Rolls, 16' Whiting, 12" & 9½" rolls.
Rolls, 12' Pyramid, 14" & 10" rolls.
Saws, 6x6 Peerless, 12x18 Racine.
Scrap baler Logeman hydraulic.
Shapers, 12"—16"—20"—24".
Large stock guaranteed electric motors. Any size.

FOR SALE BY

Jenkins Interlock Manufacturing Co.
443 N. Thirteenth St., Philadelphia, Pa.

Lathe, 12"x5' Davis, q.c., m. d.
Miller, hand.
Press, arbor, 25 ton.
Press, punch, 10 ton.
Turret lathes, 2½"x24", G. H., J. & L. (2)

Alex Zeeve
2282 Woolworth Bldg., New York, N. Y.

Bolt threaders, 4" Landis, 2" Acme "Class A", lot of dies.
Boring mills, vertical, 51" Bullard, 2 heads, m.d., 34" Rogers, spd.
Cylinder boring mill, horiz., 7" bar, swings 96" over bed.
Gear hobbers, 24" Rhenania; 18" Schuchardt-Schutte.
Hammers, power, 500 (2), 400 and 75 lb. Beaudry "Champion".
Hammer, steam, 250 lb. Niles-Bement-Pond, agle. fr.
Keyseaters, No. 3 & No. 2 Mitts-Merrill, No. 2 No. 1 and No. 0 Baker
Lathes, engine—39"x20' Rahn-Mayer-Carpenter semi-q.c. 30"x13' H. S. & G., q.c.; 29"x16' Walcott, q.c.g., taper.; 24"x16' Whitcomb-Blaisdell, q. c. g.; taper, 24"x11' Lehmann, 16 speed gd. bd., md., taper.; 21"x12' LeBlond, 12 speed gd. bd., m.d., taper.; 20"x10' Lodge & Shipley, q. c. g., bowl head, 16"x6' Kimball-Walcott, 12 spd. gd. bd., spd., others.
Miller, hand, No. 6 Whitney, m.d.
Planers, 36"x36"x14' Woodward-Powell, 1 rail head, 1 side head; 36"x36"x10' Pond, 2 rail heads, 2 side heads; 24"x24"x8', Cincinnati, 1 rail head.
Roll, bending, 10'x½" H. & J., pyramid type, drop-end, m.d.
Saw, band, 6"x6" Avey "Milband", arr. m.d.
Shaper, 16" Smith & Mills, vee-ram, gear-box m. d.
Shears, 8'x3/4" Lennox, rotary splitting, m.d., ½" capacity Kyerson throatless.
Turret lathe, 2"x26" Pratt & Whitney, b. g., hex turret, with cross-slide.

ALSO MANY OTHER TOOLS.

D. H. Prutton Machinery & Tool Co.
5295 W. 130th Street, Cleveland, Ohio

Air compressor, 50 cu. ft., Allis Chalmers, m. d.
Bolt pointers (two), Economy ½"
Box printer, single color, Hall & Brown.
Broach, No. 2 Lapointe, 2 spindle.
Chucks, 23-6"x9" Heald magnetic.
Chuck, 1-12"x40" Heald magnetic.
Drill, 4 spindle Demco, b. b., p. f. single pulley drive.
Grinder, disc, No. 50 Gardner, m. d.
Grinder, disc, No. 50 Gardner, semi auto., with fixture for grinding edges of electric iron bottoms.
Grinder, disc, No. 14 Gardner.
Grinder, disc, No. 120 Gardner.
Grinder, disc, 22" Gardner, m. d.
Millers, (two), No. 12 B. & S.
Pipe threader, 4" Bignell Keeler.
Pipe threader, 2" Oster.
Planer, 36x36x10 Woodward & Powell 1 head on rail.
Plate, polisher, No. 37L Excelsior, m. d.
Press, No. 1 Bliss cam drawing, s. s.
Press, No. P2 Ferracute.
Press No. 65 Consolidated, s. s., flywheel type.
No. 0-36 Unishear, m. d., less motor.
Manville four slide, hand feed, cap. ½x1.
Tappers, vertical (two), 8 spindle Webster & Perks.
Tapper, No. 2 Garvin.
Tappers (two), 5/8" Rickert Schafer.
Thread roller, 3/8 Waterbury.

USED AND REBUILT MACHINERY

FOR SALE BY

B. D. Brooks Co., Inc.

119 Broad St. Boston, Mass.

Sheet metal working machinery, hand and power.
All types of new and reconditioned equipment.
Apron brakes, press brakes, shears, folders.
Beading rolls, corrugating rolls, forming rolls.
Punches, beaders, rotary machines, stakes, etc.

W. L. Steege Machinery Co.

543 W. Monroe St., Chicago, Ill.

QUALITY MACHINERY since 1916

Automatics, No. 5A Potter & Johnson, (2).
Drill, radial, 36" American, cone drive.
Grinder, Heald, No. 60 cylinder grinder.
Grinder, No. 10 B. S., cylindrical.
Grinder, Bryant No. 6 chucking.
Lathes, turret, Pratt & Whitney 2x36, hollow hexagon turret, power feeds to turret and cross slide, (2).
Lathe, 20x10 American, 3 step cone, q. c., complete.
Lathe, 24x14 New Haven, loose change.
Mill, No. 2Y Brown & Sharpe, rack feed.
Planer, 28x5 New Haven, m.d.
Shaper, 26" Stockridge, single pulley drive.
Shaper, 24" Smith & Mills, cone drive.
Shaper, 7" Rhodes, cone drive.
Shear, universal circle and flanging, m. d. 12 gauge, 30" throat.

FOR SALE BY

Nesbitt Machinery Co.

110 E. Pratt St., - Baltimore, Md.

Planer, 22' plate, motor drive.
Guillotine shear, 6"x6" cap. Hilles & Jones.

Reliance Machinery Sales Company

1407 Brighton Place, N.S. Pittsburgh, Pa.

Air compressors, 139 and 450 cu. ft.
Brake, press, 6'x16 ga. Robinson.
Grinder, Bath 12x32" univ.
Grinder, 18" Diamond face, arr. m. d.
Grinder, No. 14 Besley disc, 26" disc.
Hammers, 50 lb. Mayer upright, m. d.
Hammer, 400 lb. Bliss, board drop.
Keyseater, No. 3 Baker.
Lathe, 37"x15' Reed-Prentice, arr. m.d.
Miller, 30"x10' Newton planer type.
Presses, No. 1 Toledo, O. B.I.
Press, No. 82-C Toledo dbl. crank, 8" shaft, 44" wide.
Pump, Goulds 3 stage centrifugal, 250 GPM against total head of 347'.
Punch, 48" throat Whiting, 1" thru 1", arch. jaw, belt or motor drive.
Shear, No. 352 Niagara, 52"x10 ga., m.d.
Slotter, 15" Bement, crank, 36" rot. table.
Swaging machine, No. 312 Etna, cap. 3" tubing.

What do you need? What have you for sale?

West Penn Machinery Company

1210 House Building, Pittsburgh, Pa.

Air compressors, 30 to 2500 cubic feet.
Air compr. portable gas 1-R 160 cu. ft.
Blower, No. 4 Roots, capacity 2110 c. f. m.
Bolt cutters, 1½" 2" & 3" Acme, b. d.
Boiler, 45 h.p. Titusville 110 lb. pressure.
Boring mill, 34" Colburn, turret hd., b. d.
Bulldozers, Nos. 2, 4, 6, 9, 28, & 30.
Crane, 5 ton alliance, 35' span.
Crusher, jaw, No. 4 Champion, b. d.
Die filer, No. 3 Thiel, m. d.
Drill sharpener, Ing.-Rand "Leyner", 1¾".
Drill, radial, 5' American, semi-univ., b.d.
Drills, upright 10" to 36".
Drill, No. 216 Baker, No. 5 M. T., b.d.
Engine, gas, 20 horse power Bessemer.
Gear cutters, 11" 18" & 24" Gleason.
Gear tester, bevel 18" Gleason.
Grinder, "Kwick-Way" all purpose, m.d.
Grinder, drill, No. 31 Oliver. 1¾", m. d., 220/3/60.
Grinder, internal, No. 60 Heald, b.d.
Grinder, knife 10' Bridgeport, m.d.
Grinder, roll, Farrel 30"x76".
Grinder, surface vertical, 30" table, 16" wheel, m.d.
Grinder, No. 2 Walker tool & cutter, b d.
Grinder, No. 2 tool & cutter, Greenfield, b.d.
Grinders, D. E. 2—3 & 5 h. p., 220/3/60
Hammers, 50 lb.. 75 lb., 100 lb., 200 lb. Upright.
Hammers, Nos. 2-B, 3-B, 4B, 6-B, Nazel.
Hammers, steam, forging & drop.
Keyseater, No. 1 Davis, 1"x8", m.d.
Keyseater, No. 1 Baker 1½"x12", b d.
Lathe, precision, No. 3½ Rivett, b.d.
Lathes, speed, 11" and 13" Blount, m. d.
Lathe, brass 18x6", friction head, power feed, b. d.
Lathe, 16"x12' Rahn-Larmon, geared head, t. a.
Lathe, 20"x10' Springfield, t. a., m.d.
Lathe, 26"x18" Pittsburgh, d b.g., t.a., b.d.
Lathe, Lo-Swing 6"x40", s. p. d.
Lathe, roll, 42"x20' United, m.d.
Lathes, turret, Nos. 1, 2 and 3 W. & S., b. d.
Lathe, turret No. 2½ Garvin, bar feed, b. d.
Lathe, turret, 2 spindle J&L., 2-7/8", m.d.
Lathe, turret H-21" Gisholt, 24", b.d.
Lathe, turret No. 3-D Gisholt Simplimatic.
Locomotive, gas, 6 ton Milwaukee, 36".
Miller, shaper, duplex, No. 14 Cochrane-Bly, m.d.
Miller, Lincoln No. 3? Kempsmith, b.d.
Miller, Lincoln, No. 5 Hendey, b.d.
Miller, vertical, Burke, table, 16x6, b.d.
Miller, plain, No. 2 Garvin, s. p. d.
Miller, hand, No. 6 Whitney, vert. attach.
Mixers, Sprout-Waldron, batch & liquid.
Nibbler, No. 1 Campbell 3/16", 6" gap, m. d.
Nibbler, L.&A., ¾"-36" throat, m.d.
Pipemche., 2"-4", 6"-8"12"&16" Landis-Oster-Williams.
Planer, 24"x24"x6' Gray, 1 head, b.d.
Planer, 30x30x10 Gray, 1 head, m.d.
Planer, 39"x36"x12' Cincinnati, 2 hds., b.d.
Press, forging, 150 ton United, steam hyd.
Press, toggle, 525 ton Garrison, b.d.
Press, screw, No. 87 Niagara, hand power.
Press, strip feed, No. 31-C McDonald, b.d.
Pumps, centrifugal 6", 4", 1", motor drive.
Punch, EF Cleveland, 36" throat, 1¾" thru 1".
Punch, multiple, 32E W & W, 10'2".
Riveters, air, hammer, spinning.
Rolling mill, cold 9"x18" motor drive.
Saws, friction, Nos. 2, 3 & 4 Ryerson motor drive.
Saw, metal band, Laidlaw, m.d.
Shapers, 16", 20", 21" & 36" Gould & Eberhardt.
Shears, alligator, 1½", 2", 3", 4" & 6".
Shear, Angle 6x6x½ Long & Allstatter, m. d.
Shear, Stroll 60"x3/16", motor drive.
Shear, 10'x14 ga. Ohl, b. d.
Shear, 84"x1" H. & J. 36" gap, m.d.
Shear, guill, No. 2 H. & J. 2½" rd. b. d.
Shear, guill., 4'x4" Newbold, b.d.
Shear, throatless, No. 114-M Marshalltown, ½", m.d.
Shear, up-cut, 22" Aetna, m. d.
Slotter, 54" vertical, Morton, m.d.
Straightener, 60" McKay, 17 rolls 4½", m. d.
Straightener, 84"x1" Bertch, m.d
Testing machine, 400,000 lb. Riehle, b. d.
Threader ½" Geometric, s. p. d.
Tumbling barrel, 34"x45", belt drive.
Upsetters, 1" to 6".
Welder, spot, 13 K. V. A.

FOR SALE BY

The Reeve-Fritts Company
28 N. Clinton St., Chicago

Broach, No. 3 horiz., belt drive.
Centering machine, 4" Whiton, 2 spdl.
Grinder, comb, 14" cup wheel & disc.
Grinder, Gisholt universal tool.
Hammer, 100 lb. Little Giant upright.
Lathe, 20"x8' Flather, l.c.g.
Polishing mach., Blevney, 6" band.
Saw, cold, No. 15, Lee-Simplex, 9" cap.
Tapper, No. 1 Garvin vertical, 1" cap.
Turret lathe, No. 1½ Pratt & Wright, pl. hd.

Failor-Strafer Machinery Co.
132 Liberty St., - - New York, N. Y.

Boring mill, 72" Rogers, 2 heads.
Drill, Sipp 8" overhang, b.b.
Drill, 1 Avey 3/8 cap. b. b., (2).
Grinder, Oliver 4 wheel wood tool grinder.
Grinder, 10"x36" plain cylindrical.
Grinder, No. 16 Brown & Sharpe plain grinder.
Grinder, No. 3 Brown & Sharpe cutter & reamer.
Keyseater No. 1 Davis.
Lathe, 18"x36"x9' Rahn Larmon, slide gap.
Lathe, 32"x14' Davis.
Lathe, 32"x12' Putnam, 3 step cone, d.b.g., hvy. duty.
Lathe, 30"x14' Davis, cone drive.
Lathe, 26"x10' Bridgeford, 3 step cone, taper attach.
Lathe, 26"x10' Walcott, 3 step cone, d. b. g., hvy. duty.
Lathe, 26"—48"x18' McCabe, two spindle.
Lathe, 24"x14' American 3 step cone, d.b.g., hvy. duty.
Lathe, 16"x5' Sidney, 3 step cone, d.b.g.
Lathe, turret, No. 2A Warner & S., bar equipment.
Lathe, turret 1" cap. Bie gs hand screw mach., p. fd.
Miller, No. 2 Shields, high power, single pulley.
Miller, 48" Newton continuous, m.d.
Miller, No. 1 Van Norman, hand feeds.
Presses, No. 3 Bliss Consolidated, inclinable.
Slotter, 15" New Haven, 30" table.

Joseph Hyman & Sons,
Tioga and Almond Sts., Philadelphia, Pa.

WORLD'S LARGEST STOCK
POWER PRESSES

No. 4 United Eng. & Fdry., 4 crank, 156" between uprights, 8" dia. crank 7½" stroke, weight 118000 lbs.
No. 6B Niagara, dbl. crank 36", crank 3½".
No. S 126 Ferracute, dbl. crank 124", crank 7½"—9".
No. 108 Z & H. double crank 42", crank 5".
No. 106 Bliss gap, double crank, geared.
Nos. 92B, 91C, Toledo double crank presses.
No. 56½ Consolidated, geared.
No 57 Consolidated, geared straight side, (2).
Nos. 74½, Bliss straight side.
No. 34B Bliss toggle.
No. 1½ Bliss, toggle press.
No. 104½ Toledo toggle press.
Nos PA3 Ferracute & 12 Toledo horning.
No. 42P Toledo, horning fly., m.d.
No. 204A Bliss horning, grd.
75 ton EG51 & E51 Ferracute.
800 & 600 ton American Can.
250 ton & 150 ton Waterbury Farrel, coining.
No. 23 Bliss, 250 ton, knuckle joint.
150 ton EG52 Ferracute, knuckle joint.
No. 9C Badger State combination punch & shear.
No. 6 Hilles & Jones multiple punch.
Punches & shears, single & double end.
Squaring shears, various sizes.
These and hundreds of others of popular makes and sizes, are in stock at our warehouse here.
Rebuilt and Guaranteed.

FOR SALE BY

Liberty Planers, Inc., - Hamilton, Ohio

WANTED
Vertical boring mill, 60" or 72".

The Nutmeg State Machinery Corp.
1041-1051 State St., New Haven, Conn.

Boring mill, Espen Lucas No. 26, 4" bar with ex. table.
Grinders, Bryant No. 30, chucking, 35" swing, motor driven by 3 motors, (3).
Grinder, Brown & Sharpe No. 2 universal.
Grinder, Cincinnati, 12"x36" universal.
Thread millers, Pratt & Whitney 6"x48", complete with gears, pumps, tanks, countershafts, (2).
Turret lathe, Pratt & W. 2½x26", grd. hd., complete.

Russell Machine Co.
438 Oliver Bldg. Pittsburgh, Pa.

Boring mill, 42" Bullard, 2 swivel heads, b. d.
Boring mill, horiz. 3-3/8" bar D & H, floor type.
Boring mill, horiz. 5" bar Barrett, b.d.
Boring mill, 8' Betts, 2 hds. grd. feeds, b. d.
Gear cutter, spur, 84" Newark, m.d.
Gear planer, bevel, 54" Gleason m.d.
Gear planer, Bevel, 36" Gleason, b. d.
Hammer, No. 2 "B" Nazel Power Hammer, m. d.
Hammer, 300 lb. Bradley, upright strap.
Hammer, 1500 lb. Bliss board drop.
Lathe, 42"x17'6" Pond, p.c.g., triple grd., b.d.
Planer, 36"x36"x14' Gray, 4 heads, b d.
Punch, multiple, style "E" L & A 150 th. cap. 340 tons.
Punch, beam, Cleveland, cap. 24".
Shaper, 24" Cincinnati, m. d.
Shear, Alligator, No. 61 Carlin high knife, 2½" sq.
Slotter, 18" Bem. Miles, table 36" dia., b.d.
Upsetting machines, 2½, 3½, 4 and 5" Ajax iron bed.

Machine Tools Sales Company
513 N. 17th St., Philadelphia, Pa.

511' 15x9x10 Chi. pneu. O-CB, mtr. dr.
Auto. 2", Model B. Cleve., Ser. over 33,000.
Auto. 1½" Model A. Cleve., Ser. over 30,000.
Auto., 5/8-7/8" Model A Cleve., Ser. over 30,000.
Axle lathe, Bridgeford, dble. end, center dr., q.c.g.
Bor., No. 3, 6" bar Barrett hor., cyl., m.d.
Drill, radial, 8' Sellers, m.d.
Grinder, 10"x36" Landis pl. self-cont.
Grinder, No. 2 Landis univ. 12"x32" c-shaft.
Grinder, 7-5/8x16" Sichel hob.
Lathe, 27"x18' Lodge & Shipley, m.d.
Lathe, 26"x14' Bridgeford pl. turn., m. d.
Lathe, 20"x8' Prentice, gd. hd.
Lathes, 28"x6' Springfield mfg., (2).
Lathes, 18"x6' Springfield mfg., (2).
Miller, No. 2½, 72" Pratt & W. dble. spdl.
Miller, No. 2 M Potter & J. mfg., s.p.d.
Miller, Putnam Mfg.
Miller, thd. 11"x24' Milled Screw Co.
Planer, 68"x50"x10' Cincinnati widened pattern.
36"x36"x14' Hamilton, 3 hds.
Planer, 22' No. 2 Hilles & J., plate.
Punch, No. 6 Hilles & J., 62" throat.
Saw, 9"x9" Peerless hack.
Slotters, 18" Sellers.
Slotter, 14" Betts, crank.
Slotter, 12" Bement, crank.
Strip mill, 16"x24" Bliss 2-hi., cold.
Tire setter, No. 6 West hydr., 18 cyl. 30" to 62" with Triplex pump.
Trucks, 4000 lb. cap. Tier Lift Trucks, Baker, Automatic Transportation, Lakewood (4).

USED AND REBUILT MACHINERY

FOR SALE BY

Wiener Machinery Co.
237 Centre St., - New York City

Low Priced Machines
Gear cutters, 48" Brown & Sharpe, m.d., (4), $450.00
Gear cutter, No. 12 Brown & Sharpe, m. d., $450.00.
Grinder, No. 12 Brown & Sharpe univ. tool & cutter.
Lathe, 24x10 Hendey, raised to 32".

John D. Hollingsworth
On-Wheels
P.O. Box 501, Greenville, South Carolina

Engine lathe, Greaves & Klusman, grd. bd., 16" swing x 8' bed, clearing 4' centers. Machine in excellent condition. Equipped with m. d., apron control, q. c. gearing throughout. Late model, forced sale, priced for sale directly to user.

The Elyria Belting & Machinery Co.
Elyria - - - - - Ohio

Drill presses, 6 spindle National Acme.
Drill press, 4 spindle Allen.
Pump, Rumsey, 10½x10, 7½" inlet and outlet.
Rolls, corrugated, 32" belt drive.
Nut tappers, ⅝" and ¾, National.
Turret lathe, J & L, sliding head.

Foster Machinery Co.
3982 Bluestone Rd. Cleveland, O.

Bulldozer, Williams & White No. 4, double end.
Forging roll, No. O.C. Ajax.
Lathe, 13x6, South Bend.
Punch, Long & Alstatter, 36" throat, 1½" cap. arch jaw.
Saw, 6" Newton, cold.
Saw sharpener, 11S Cochrane & Bly.
Welder, ⅜" butt.

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Special Machine Tool Engineering Works
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PROJECTION LATHE.
9" Porter-Cable or Lite.
Send photographs and literature.

IN STOCK

Waltham Gear Cutter, cap. 4" diameter
Gould & Eberhardt Spur & Bevel Gear Cutter, No. 1036
No. 16 Natco Multiple-Spindle Drill, 16 spd.
Type B Briggs Production Millers
Model B Becker Vertical Miller
No. 33 New Britain Chucker
24"x12' Hendey Lathe, cone
Garvin Die Slotter
No. 1-½ Garvin Duplex Miller
Fairbanks Hammer

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SPEED REDUCERS
REEVES DRIVES
Any Quantity—All Sizes, Types

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156 GRAND ST. NEW YORK CITY

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For immediate delivery

INDEPENDENT CHUCKS 4 JAW, all sizes 4¾" to 36" Diameter.

GEARED SCROLL UNIVERSAL CHUCKS.

James W. George Machinery Co.
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Detroit, Mich.

CAN BE SEEN IN OPERATION

Landis 16"x66" Pl. Cylindrical Motor Driven Grinder. Ser. No. 5056
Van Norman, No. 2 Relio Grinder, Motor Driven, Serial W504.
Whitcomb Planer, 18'x18"x5' with 1 Head, countershaft, arranged for Motor.
Hutto 8' Radial Arm Cylinder Honing Machine Motor driven with variable speeds and 20 sets stones. Ser. No. 1062
Hannifin 20 Ton Hyd. Arbor Press with self cont. Mtr. Dr. & pump. Ser. No. 3986

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18-10-12-1000 gal. per minute. Steam driven.
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CUTTERS-ENDMILLS-SAWS
HACK SAW BLADES

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WESTERN TOOL EXCHANGE
18 N. Halsted Street, Chicago, Illinois
SURPLUS BOUGHT AND SOLD

1½" Acme Turret Lathe, GFH, bar feed.
No. 3 Owen Universal Miller.
No. 7 Bardons & Oliver Turret Lathe, G. H., 4¼" H. S.
16" G. & E. Shaper, all-geared, M. D.
14"x6' Hendey Lathe, T. A., motorized.
No. 3 Lees Bradner Thread Miller, 3⅓" collet cap.

BARRON MACHINERY COMPANY
563 W. WASHINGTON, CHICAGO, ILLINOIS

SELLING FOR CUSTOMER
CAN BE SEEN IN OPERATION

Milling Machine: No. 2 Cinc. all grd. hd., S.P.D., Ser. No. 4475-S; full univ. equip. incl. div. head, vise, gears, arbors, vert. and slotting attachments
Lathe: 20"x8' Monarch Q.C.G., D.B.G., Ser. No. B189-17; dbl. fric. c/s; 14' 4-jaw indep. chuck, 20" face plate, steady and follow rest and centers
Drill Press: New Albany Toolroom B.B. Drill Press, ½" cap., fric. drive, with ½" Jacobs chuck

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3845 W. Madison St., Chicago, Ill.
Tel. KED. 0212

FOR SALE — GOOD TOOLS

Drill, Automatic, Sensitive, with motor, hi. spd., cap., 3/16" .....$150.
Drill, 2 spd. Allen H. S. B. B. 14" Swing, No. 2 M. T. .....$300.
Drill, Foote Burt No. 24, 24" Heavy Duty .....$1000.
Radial Drill, 2' Fosdick, M.D. 220/60/3 .....$750.
Radial Drill, No. 7, 4' Prentice M. D. 220/60/3 .....$1500.
Gear Cutter, No. 6 B. & S., Cap. 60"x11" .....$3500.
Grinder, No. 2 Landis Univ., 12"x30", Belt Drive .....$2500.
Grinder, 12"x24" Plain B.D. No Name..$250.
Grinder, 16"x96" Safety, M.D. 26" Wheel .....$4500.
Grinder, Disc, Besley No. 8, 20" discs, two univ. tables, b.d. .....$250.
Lathe, 12x5 Simplex, QC., Geared Head, arranged for Motor, ...$1000.
Lathe, 14x6 Carrol Jamieson, Q. C...$600.
Lathe, 14x6 Seneca Falls, Q.C.—Taper .....$700.
Lathe, 16-18x6 American, Q.C.—Heavy .....$1150.
Miller, Plain Head, Power Feed, 6x30 Table, ...$250.
Planer, 36"x36"x12' Woodward-Powel, 2 Heads, with Motor .....$2500.
Press, No. 2 Rockford O.B.I. 2" str. 22 Ton .....$325.
Press, No. 126 Max Ams O.B.I. 1" str. $325.
Tapper, No. 2 Garvin, Auto., with Motor Cap., ¼ to ¾" .....$250.
Turret Lathe, 2x24 J & L, Geared Head and Feeds .....$1150.
Threader, Namco, 2-sp., ¾" Cap.....$200.
Miller, No. 2, Craftsman Rotary $750

BANSBACH MACHINERY CORP.
3845 West Madison Street, Chicago
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Test yourself on the Blue Book Quiz

How many of the questions can YOU answer that are shown on page 165 in this issue?

CONSIDER GOOD USED EQUIPMENT FIRST!

IMMEDIATE AVAILABILITY AND DELIVERY ARE IMPORTANT FACTORS

AIR COMPRESSORS
355 cu. ft. 12"x10" Ingersoll-rand Class ER-1 B.M. Drive 100 lb. Pressure
574 cu. ft. 14"x14" Chicago Pneu. Class NSB, B.D. 100 lb. Pressure

BENDING ROLLS
10' Bertsch, M.D. Cap. ¼" Plate
10' Bertsch, M.D. Cap. ⅜" Plate

BORING MILLS—HORIZ.
5" Bar P & H Boring, Drilling & Milling Machine, Arr. M.D.

BRAKES—PRESS TYPE
12' Ohl, B.M.D. Cap. ⅜"

BRAKE—LEAF TYPE
10' Dreis & Krump, Arr. M. D. Capacity ¼" Plate

BUILDINGS
75'x247' Steel Building
80'x743' Steel Building
110'x240' Steel Building with 6 ton Toledo Crane 106' Span 220 v. 3 ph. 60 cycle

BULLDOZER
No. 7 Ajax, Motor Drive. Face of Crosshead 12"x76", Stroke 16"

CRANES
3 ton P & H 22'6" Span 220/3/60 A. C.
7½ ton Bedford 67'2" Span 220/3/60 A. C.
10 ton Alliance 32'3¼" Span 220/3/60 A. C.
10 ton Toledo 32'3¼" Span 220/3/60 A. C.
15 ton Niles 48'11-¼" Span 220/2/60 A. C. Including Phase Changer
20 ton Case 55' Span Hand Operated
25 ton Niles 30' Span 230 Volt D. C.
50 ton Niles 30'6" Span 220/3/60 A. C. 5 ton Auxiliary

DIE SINKING MACHINE
Keller Model "P" Die Sink. Mch.

FORGING MACHINES
3" to 7" Ajax, Nat. Acme St. Fr.

HAMMERS—BOARD DROP—STEAM DROP-STEAM FORG.
1000 lb. to 8000 lb. Chamb. B. & Sp. Erie. N-B-P Morgan

JOGGLING MACHINE
Hilles & Jones Plate Joggling Machine, cap. ½" plates 42" from edge or 1" plate 12" from edge. Arr. for M.D.

LEVELLER—HYDRAULIC
48"x12" Britten Hydraulic Horizontal Sheet Stretcher Leveller, Motor Driven. Complete with triplex hydraulic pump.

LEVELLER—ROLLER
50" McKay Motor Driven 17 Rolls 4-¼" Dia.

72"x72"x14' GRAY THREE HEAD PLANER
Table 65½" Wide, 8½" Thick
Cross Rail Raises & Lowers By Power

400 TON SOUTHWARK 4-COLUMN HYDRAULIC PRESS
30"x30" bet. colums 50" Stroke

NO. 96F TOLEDO DOUBLE CRANK PRESS
124" Between Uprights
12" Stroke
Tie Rod Construction
Complete with 40 H.P. Motor

16' Bertsch BENDING ROLL PYRAMID TYPE-DROP END HOUSING MOTOR DRIVEN CAPACITY ½" PLATE

72" STAMCO POWER SQUARING SHEAR
Motor Driven
Hold Down Clamps and Gauges
Capacity No. 14 Gauge

MILLING MACHINE—PLANER TYPE
42"x42"x16' Ingersoll Single Face Adj. Rail Planer Type, B.D.

PIPE MACHINES
4" Landis, motor driven, complete with cutting 0" attachment and chamfering attachment
8" Standard Engineering Co. Pipe Threading and Cutting Machine, arr. for M. D.
16" Williams Pipe Threading Mch. M. D.

PRESSES—HYDRAULIC
760 ton Southwark, 41½x19" Between Columns
3000 ton Southwark Forging Press, 3 column, 17" dia. 7" between Columns, 15 stroke 30" daylight

PRESS—HYDRAULIC FLANGING
200 ton Southwark Hyd. Sectional Flanging Press. 2 Vert. rams, 1 horiz. clamping ram, 1 stripper ram. Table 54"x72"

PRESS—DOUBLE ACTING TOGGLE
No. 162 Toledo Punch Press. Bed Area 21" x 21". Stroke of Blankholder 5". stroke of Plunger 8½"
No. 408-A Bliss Double Crank. Bed Area 72"x50". Stroke 15"

PRESSES—SINGLE ACTING—STRAIGHT SIDE
No. 166½ Consolidated, 6" stroke 47" between Uprights
No. 10-C Bliss, 6" Stroke 84" between Uprights

PRESSES—MISCELLANEOUS
1 D-45 Ferracute Press. Horizontal Double end screw type 36" ram stroke
No. 6 Bliss Horizontal Reducing Press B. D. 8" stroke
No. 856 Toledo, rack and pinion press, Stroke around 5" to 36" Bed area 22"x22"

PUNCH—HORIZONTAL
No. 2 Hilles & Jones, Arr. M.D. Cap. punch 1" thru 1"

PUNCH & SHEAR COMBINATIONS
No. 6 Whiting Arr. M. D. 36" Throat, Cap. Punch ¾" thru ¾"
No. 14½ Williams & White, Arr. M.D. 36" throat, Cap. punch 1" thru 1"
Style E Cler. Sgle. End Arr. for M. D. 27½" throat Cap. Punch 1" thru 1"

ROLL—TAPER FORGING
No. 2 Ajax Taper Forging Roll

ROLLING MILLS
10x9" Acme Four Stand 2 High
10"x12" UE&F Co. Sgle. Stand 2 high
16½x22" Cold Strip Mill 2 stand 2 high
15"x38" Farrel Sgle. Stand 3 high rod mill
10" Garrison Bar Mill 5 stand 3 high
16" Garrison Bar Mill 3 stand one 3 high and one 2 high
24" Machintosh Bar Mill 2 stand 3 high
28" Mesta Sheet Mill steel Housings

SAW
50" Mackintosh Hemphill Tilting Frame Hot Saw Motor Driven Capacity 8"x8" Blooms

SHEAR—GATE
96" Morgan, Arr. for M.D. Capacity plate 1½"

STRAIGHTENERS
½" Shuster Wire Straightening Machine, M.D. 20' cut-off
1" Shuster Automatic Wire Straightening Machine, arr. for M.D. 14' cut-off
Shuster Shape Straightening Machine, M.D Cap. 1" hex.

TESTING MACHINE
30,000 lb. Riehle Bros. Universal Testing Machine, M.D.

Entire Surplus Manufacturing Equipment Inventories Purchased.
Appraisals. Liquidations. Consulting Engineering Service.

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PLENTY OF GOOD USED TOOLS

AIR COMPRESSORS

136', 8x8" Chicago Pneumatic, type NSB
136', 8x8" Ingersoll Rand, type ERI
357', 12"x10" Bury, class HL
369', 12x10" Chicago Pneumatic, class NSB
550', National 3-cylinder vert.
620', 14 x 8 ¾ x 10" Sullivan, class WJ3, angle compound, 2-stage, synchronous motor
676', 15x9¼x12" Ingers. Rand, type XRE2, 5-step unloading synchronous motor on shaft
706', 17x9 ¾x12 Sullivan, class WJ3, angle comp., 2 stage
868', 17x10x12" Chicago Pneumatic, type OCB, 2-stage

BROACHES

No. 1 LaPointe, screw type
No. 2 Standard screw type broaching press
No. 3 LaPointe of Hudson, screw type
No. 3 J. N. LaPointe double screw type
No. 3 Amer. hi. sp., rack type
No. 3 Oilgear hyd., mtr. dr.
No. 4 LaPointe of Hudson, screw type
2 ton American vertical

GEAR CUTTERS

24", No. 3 Adams Farwell gr. hobber
No. 18H Gould & Eberhardt universal gear hobber
12"x13" No. 12HS G. & E. Mfg. hobber
12"x10" No. 12 B. C. hobbers
8"x10" No. 1 L. B. prod. hob.
14"x8" No. 5A L. B. univ. hob.
26"x8" No. 3 B.&S. auto. spur
36"x6" G. & E. spur gear cut.
48' x10" No. 4 B.&S. auto. spur
No. 71 Fellows gear shaver
15" Gleason bevel gr. quench.
Gleason bevel gear tester
Gleason circular finishing cutters, without blades
Bilton automatic gear millers
National Tool Co. (Cleveland) Mod. B gear & gear shaper cutter checking machine
Lipe gear tooth chamfering machine, double spindle
Pratt & Whitney worm grinder

ENGINE LATHES

14"x8' Lodge & Ship., pat. hd.
20"x10' American
20"x10' Davis, dbl. back grd.
24"x10' Schumacher & Boye, dbl. back gears, taper att.
24"x10' LeBlond heavy duty, dbl. back gears, taper att.
24'x10' Hendey stamd. chge. gear
24"x12' Lodge & Ship. pat. hd.
24"x14' Schumacher
24"x16' Schumacher & Boye dbl. back gears, taper att.
36"x22' S. & B., triple geared
42"x18' New Haven

PLANERS

24"x24"x24" Cin. crank type, one rail head
24"x24"x6' Gray
24"x24"x6' Woodw. & Powell
24"x24"x8' Rock., one rail hd.
26"x26"x8' American
30"x30"x10' Cin., one (or two) rail heads
32"x32"x12' Niles, 1 rail and 1 side head
54"x42"x12' Gray
56"x56"x16' Gray, 2 rail and 2 side heads

SHAPERS

24" Rockford
24" Walcott
24" Cincinnati
36" Morton draw-cut
48" Morton draw-cut

MISCELLANEOUS

No. 5, 23 & 29 Williams & White bulldozers
Barnes single spindle horiz. diamond boring machine
Coulter double spindle diamond tool bor. mch. A121
44" 2-arm Norton balancing machine
4"x12" Sundstrand double end centering machine
4"x36" Sundstrand double end centering machine
No. 2 Heim centerless grinder
150 HP General Electric dynamometer type TLC-50
10 HP GE dynamometer
Hutto vertical single spindle honing machine, Model MD
No. 3 and 4 Mitts & Merrill keyseaters
Burr keyseat miller
750 ton Bald win Southw. trpl. act. hyd. toggle draw. press
108" No. 796¼ Toledo double crank toggle drawing
No. 180 Toledo toggle draw.
No. 30E Cleveland SS
Young Bros. japanning oven
No. 575 Hawes tube polishers
No. 6½ Holmes swg. ctof. saw
Magee No. 3RH sheet metal wiring & edging machines
No. 6 American Machinery Co. upsetter or forging machine
Amer. Elec. Fusion spot weld.
100 KVA Thomson Gibb M24-100 pwr. auto. spot or Projection welder
75 KW No. 61 Federal butt welder
150 KVA Swift flash butt weld.
⅛"x1" to 12" Lewis No. 7 core wire straightener
½"x6' Shuster automatic wire straightener
F. J. Littell No. 6 b-b wire reel

Ask for our latest stock list.

MILES MACHINERY CO., SAGINAW, MICH.

• UNUSUAL TOOLS •

SOLD WITH AN ABSOLUTE GUARANTEE OF SATISFACTION

Automatics
Cleveland, Models A, C, 1¼", 2"
Model J Cleveland dble. end
National Acme 3" Model B, motor drive
Nos. 24 & 34 New Brit. Auto. Chucking, m.d.

Drills
2, 3, 4 spdl. H.&W., Allen Lel-Giff., Avey (33)
3' & 5' Western Radial
3½' Morris Radial, m.d. & m.
Pratt & Whitney dble. end., m.d. & m.
Moline Hole Hog, various sizes (5)
Fox Mult. Spdle. with tapp. att. (4)
No. 121 2-spdle. Baker Gang Type, mult. sp. heads, rot. tables, m.d. & m. (3)
21" Cinci., Prod., box column, g.m.d. & m. (3)

Gear Equipment
No. 36 ST G. & E. Auto., 4 spdl. Gr. Rgh.,m.d.
No. 5A Lees Bradner Gear Hobbers, (3)
W & W Gear Cutter, cap. incl. gears up to 96" dia. x 52" face

Grinders
Nos. 15A & 20 Bryant Chucking, Int. and Face
20"Badger Face, hyd. feeds, table travel 44"
Nos. 55 & 60 Heald Internal
No. 6 Besly Double Disc
No. 132 Arter Drum Type, motor drive (2)
Norton Model B Tur. type, motor drive (2)
No. 1 Osterholm, face
No. 126 Gardner dbl. spdl. op. m.d. type, h.f.
12" and 16"x36" Cincinnati Pl. Cylinder, (2)
10"x36" Norton Pl. Cylindrical

HEAVY DUTY LATHES
24"x16' Prentice, Geared Head, taper attachment, single pulley drive
36"x16' Hamilton, geared motor drive & motor, double back geared
28"x10' Chard, quick change, taper attachment, double back geared
36"x20" Lodge Davis, t. a., back geared
60"x10' New Haven, back geared, center to center 60"
28"x14' Walcott Bk. Grd., quick change gear, taper attachment

Lathes
20"x8' Gisholt Turret, (4)
18" Cinc. Acme Turret, back geared (3)
2¼" Jones & Lamson Screw Machine
3"x36" J & L Flat Turret, s.p.d.
No. 6 Brown & Sharpe Turret,
16"x8' Hamilton, m.d. & m., t.a.
16"x8' Bradford Geared Head
Nos. 5A & 6A Potter & Johnson Auto., m.d.
Lo-Swing, 60" bet. cent. 12" swing
18"x7' American, geared head
16"x6' Hendey, quick change gear, motor dr.
16"x12' Lodge & Shipley, q.c.g, t.a.

Mills
Nos. 1, 2 & 3 Craftsman Prod., Rotary
4-spindle Newton Rotary Drum Type Miller
No. 2 Cincinnati Plain
Nos. 3 & 5B Becker Vertical
54" Ingersoll Rotary, 3 head, m.d.
66" Newton Rotary, motor drive
96" Sellers Vertical Boring

Planers
36"x60"x14' American, wid. to 60", rl. insd. hd.
42"x42"x12' Bedford Openside, m.d. & m.
36"x36"x8' Pond Planer, one rail, one side hd.
30"x30"x6' Pond Planer, 2 rail heads

Presses
Nos. 4A & 5 Adriance, O.B.I.
No. 6 Toledo, O.B.I.
Nos. 73½ & 74½ Bliss motor drive & motor
23A Bliss Dble. cr., gap frame, m.d. & m.
251½ Cleveland Dble. Cr., gap frame, m.d.&m.
No. 30G32 Cleveland D.C., m.d. & m.
No. 55½ Toledo Tie Rod, with dble. roll fds.
No. 62 Toledo (2)
No. 63 Michigan, S.S.
Nos. P2-P4 Ferracute, motor drive
Canco, No. 5, 8" stroke, S.S., B.G., m.d. & m.
DG-53 Ferr. S.S., S.C., B.G., G.M.D.
No. 6C Rockford dble. cr., straight side

LARGE DOUBLE CRANK PRESSES
No. 407 Bliss Double Crank Toggle Press, motor drive & motor
No. 410 Bliss Double Crank Toggle Press, motor drive & motor
No. 10C Bliss Dble. Crank, Tie Rod Frame
No. 7D Bliss, Double Crank, Tie Rod Frame, motor drive & motor (2)

Shears
Niagara, Nos. 10, 152 and 236

Upsetters
1" National, Steel Bed
1½" Acme, steel bed, m.d.

X-Ray machine, 250,000 volt General Electric, lead lined, will X-Ray boiler plate up to 2" thick, overall dimensions, length 102", width 84", height 88"

Welders
Federal, 150 KW, motor drive
35 KVA Multi Hydromatic, mtr. dr. & m.
Taylor Win., Nat'l, Fed'l, Thomson, m.d. Butt & Spot
Taylor Winfield 4-way flash welder

200 KVA Thompson Gibb Seam Welder, Type 1020-CS-200, Air Operated, motor driven, with Reeves Control & Thyratron Control Panel. Clark Contactor

Miscellaneous
Balancer, 18" Gisholt Static, arr. m.d. with 4-speed head (2)
Bulldozers, Nos. 3 and 5 Williams & White

AND A COMPLETE STOCK OF FINE UP-TO-DATE EQUIPMENT

HARVEY GOLDMAN AND CO.

10571 GRATIOT AVE. DETROIT, MICH.

MACHINE TOOLS IN STOCK

AUTOMATICS
2-⅞ Model A. Cleveland
2-2¼". Cap Acmes 4 spd. m-d.

BORING MILLS—Horizontal
5½" bar Duplex Southwark-Table type Mt. dr.
3½" bar D&H Foor type m-d.

BORING MILLS—Vertical
60" Niles 1 Pl. Swivel head—1 Milling Hd.
44" N.B. & P. motor drive
42" Bullard Mt. Dr.—1 Pl. hd.—1 turret head, rapid trav.
48" N.B. & P. Car Wheel borer, M. D.

DRILLS
4' Bickford Un.
4' Bickford Pl. mt. dr.
2 & 4 Henry & Wright Sensi.
4 spd. Fox
4 spd. Demco, pwr. fd. to spd.
1-24" Barnes Camel Back, Motor Drive
4-22" Barnes, pwr. fd. Mt. Dr.
1-36" Cinn. Bickf. slid. hd.
36" Aurora
36" Superior
1-4 spd. Barnes No. 4 Morse taper 82"x17" table, power fd. to spd. Motor Drive
1-16 Spd. Bausch Mt. dr. Oil grooved base 36x54 Rec. hd.
2 Spd. Webster & Perks, horz. Tapper
1-2X Garvin Automatic Tapper

GEAR MACHINERY
1 Whiton Auto.
1-No. 6 Fellows Gear Shaper

GRINDERS
10x48 No. 14 B & S Pl.
8x36 Fitchburg Pl.
2-10x24 Landis Pl.
1-2 ½ Bath Un.
2—No. 3 B & S Tool & Cutter, all attachments
12x36 Landis Un.
Hardinge Precision
2-No. 1 Frazer Un.
No. 11 B & S Pl.
3—No. 2 Gallmeyer & Livingston Un. Tool & Cut.—all at.
2-No. 2 Oakley Un. Tool & Cut.
1-12x48 Pratt & Whit. Ver. Surf.
1-No. 3 Diamond Surf. Mt. Dr.
1-12x60 Norton Cyl. Pl.

LATHES
3—12x5 Clev. G. Hd. Tap. At.
14x8 American C.P.D.
16x8 Flather Motor Drive
16x10 Sebastian G. H. Mt. Dr.
17x8 South Bend C.P.D.
18x10 South Bend C.P.D.
14x8 LeBlond G. Hd.
14x6 LeBlond 3 stepconeD.B.G.
2—18x8 Mueller, 3 stepcone D. B. G.
2—18x8 Morris 3 stepcone D. B. G.
16x10 L & S Gd. hd. Mt. dr.at.
20x8 LeBlond Turret Full Un. 3 step cone
24x12 Shoemaker & Boye DBG.
30x18 Monarch 3 stepcone DBG. Bowl Type hd. T. Att.
32x20 New Haven
48x18 American Triple geared
50x24 Fifield Triple geared
4x60 Fitchburg Low swing—new cond.
42x26 Bement Triple geared

PLANERS
56x56x11 Gray Rev. Mt. dr. 2 rail hd., 2 side heads
30x30x8' New Haven
26x26x7' Gould and Eberhardt
22x22x4' Hendey

TURRET LATHES
No. 0 Bardons & Oliver 1"cap.
19x8 LeBlond Full Un.
No. 1 Bardons & Oliver
4" Conradson Un.
28" Gisholt Un. Taper Attach.

MILLERS
1—No. 2 LeBlond Pl.
1—No. 3 Cin. Pl.
No. 4 H LeBlond Pl. with Ver. Head
1—No. 2 Kempsmith Un.
1—No. 2 Osterlein Un. Vert. Head
Hendey & Becker Lincoln Type
1—A B Becker Vert. Rotary Table New Cond.
2-No. 1 Fox Pl.
1—25 Becker Pl.
No. 3 Lees Bradner Thrd. Mill.
Holden-Morgan Thread
12x60 Pratt & Whitney Thread
1—No. 3 Hendey-Oscillating

PRESSES
Bliss In. Geared Mt. Drive
2—No. 2 Standard O.B.I.
2—No. 18 Bliss O. B. I.
2—19½ Bliss O. B. I.
4¾ Michigan O.B.I.
Ferracute Bench O. B. I.
92 C Toledo Geared Mt. Dr. Steel Tie Rod
Toledo Arch. geared Mt. Dr.
No. 37 Niagara Back Flywheel Mt. Dr.
No. 6 Stiles & Parker Geared
No. C G 14 Ferracute O. B. I. Automatic Roll feed

SHAPERS
26" Kelly Mt. Dr.
24" Milwaukee C. P. D.

WELDERS
1—50 KW Thompson Spot Welder Automatic
35 K.W. Thompson Spot Welder Automatic
2—200 AMP Arc Portable

PIPE MACHINES
10" Cox
203 A Oster 6" cap.
10" Bignall and Keeler
2" Bignall & Keeler Mt. Dr.
6" Stover Mt. Dr.
Acme & Landis Bolt Thrd. Mh.

SAWS
3" Burr Cold
No. 12 Higley Cold
12" Sterling Hack
No. 3 Klemm Metal Band Saw

MISCELLANEOUS
No. 1 Buffalo Iron Wkr. Mt. D.
6' 10 ga. D & K Leaf Type Brk.
3 Grant Rivet Spinners
3 A High Speed Hammer
Morton Keyseater 4" Cap.
Nos. 0, 2 & 3 LaP. Broaches
2—Productomatics
1—No. 1 Grey Nibbler Turret Type
8-Double Leg Steam Forging Hammers 3000 lb. to 1000 lb.
1—6" Slotter Pilton

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Introducing in Our Territory

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WILOX CLOTH SHEETS

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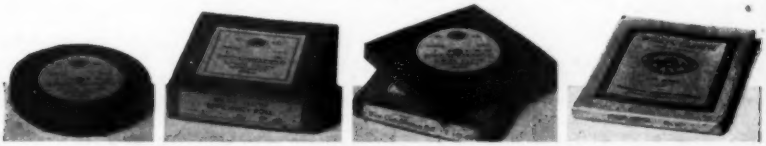
WILMINGTON ABRASIVE WORKS, INC.

WILMINGTON, DELAWARE, U. S. A.



Our Net Prices Compared with List Prices:

WILOX CLOTH EFFICIENCY ROLLS

Prices Per Roll of 50 Yards

WOUND ON SPOOLS AND BOXED

GRIT NO.	100 & Finer		80		60		50		40		36		30		24	
WIDTH	List Price	Our Price	List Price	Our Price	List Price	Our Price	List Price	Our Price	List Price	Our Price	List Price	Our Price	List Price	Our Price	List Price	Our Pri
½ Inch	$1.75	$ .95	$1.85	$ .95	$1.95	$ .95	$2.05	$ .95	$2.15	$ .95	$2.25	$ .95	$2.35	$ .95	$2.45	$
¾ "	2.35	1.25	2.45	1.25	2.60	1.25	2.70	1.25	2.85	1.25	3.05	1.25	3.20	1.25	3.40	1.
1 "	2.90	1.50	3.00	1.50	3.25	1.50	3.40	1.50	3.60	1.50	3.85	1.50	4.05	1.50	4.30	1.
1½ "	4.05	2.25	4.20	2.25	4.50	2.25	4.80	2.25	5.10	2.25	5.45	2.25	5.75	2.25	6.10	2.
2 "	5.15	2.90	5.40	2.90	5.80	2.90	6.15	2.90	6.55	2.90	7.00	2.90	7.45	2.90	7.95	2.

WILOX CLOTH SHEETS

Per Ream of 480 Sheets, 9"x11"

GRIT No.	100 & Finer		80		60		50		40		36	
	List Price	Our Price	List Price	Our Price	List Price	Our Price	List Price	Our Price	List Price	Our Price	List Price	Our Price
9" x 11" Sheets	$54.70	$33.00	$58.10	$33.00	$63.10	$33.00	$67.60	$33.00	$72.70	$33.00	$78.40	$33.00

ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE.
ALL PRICES F.O.B. YOUR PLANT ON ORDERS OF $5.00 AND OVER.

IF WHAT YOU WANT ISN'T HERE *Send Us Your Inquiry*

BRAKES:
2 ft. S-L 18 ga. hand

DRILLS:
Radial, Sens, 3 ft. American
Radial, 3 ft. Fosdick
Natco Type K 20-spdl.
Rail, No. 2 Foote-Burt 4-spindle
Prentice, 4-spdl. high-speed
Allen RB Type B sgl. spdl.
Demco DAH 3/8" bb, M.D.
14" U. S. $35.00
20" Barnes B. G. & P. F.
24" Sibley & Ware B. G. & P.F.
25" Bickford, sl. hd. BG & PF.
25" Gould & Eberhardt BG & PF
28" Hamilton sl. hd. BG & PF.

GRINDERS:
Disc, No. 6-20 Besly
Disc, No. 41 Besly, motor dr.
Disc, No. 220 Badger & press
Drill, New Yankee, D.E.
Elec., Hisey-Wolf 3-6 BOA BB
Flex. shaft, RA 5 Haskins
Emery, DE, Norton 24"
Emery, DE St. Louis 18"&20"
Internal, Madison;
Surface, No. 1 La Salle.
Wet tool, Springfield, 27" wheel

LATHES:
26"x14' Niles, PCG
22"x10' Whitcomb-Blaisdell
20"x8' LeBlond QCG, DBG
20"x8' Bradford, PCG MD.
18"x8' Rahn & Mayer PCG
16"x8' Fay & Scott QCG
16"x8½' American Q.C.G.
14"x6' Monarch Q.C.G.
14"x8' Rumsey, PCG
10x46" Seneca Falls "Star"
9"x3' South Bend 420-Y MD.

LATHES—Turret:
2x24" Jones & Lamson
12" Reed-Prentice BG

PRESSES:
Arbor, Famco and Atlas.
Cam Drawing, 69-N Bliss
Dbl. Crank, No. 37 Excelsior
Foot, Famco and No. 4 Swaine
O.B.I. Wold, 1350 lbs.
Punch, No. 5 Bliss Stiles
No. 20 Excelsior 1" in 4"
O.B.I. No. 1 L & J, new
O.B.I. No. 3 L & J, new

PUNCHES & SHEARS:
SE, Cleveland C ¾ in ¾", 20" thr.
SE W-W 14½, 25" thr. 1 in 1"
Rock River L, 24" thr. ½ in ½"
DE 1-10 Badger ½ in ½", 10" thr.

SAWS:
Band metal, 14" Racine
Cold, Higley, 20" saw, No. 17
Cold, Higley, 18" saw, No. 14
Hack, No. 3 Robertson 6x6"
Hack, No. 14 Atkins 6x6"

SHAPERS:
16" Davis, sgl. pulley drive
16" Milwaukee B.G.
20" Smith & Mills
26" Hendy planer type dr.

SHEARS:
Dbl. action, No. 11 Excelsior, inside cutting, cap. 10 ga.
Rotary Bevel, Lennox ½"
Slitting, Niagara, cap. ¼" Square, 38" Bertsch, power
Throatless, 18 H Marshalltown

THREADERS, Pipe & Bolt:
Murchey, 3" dbl. head, bolt
Pipe, 2" Outer No. 302
Pipe, 4" 2-A Williams

MISCELLANEOUS:
Bender, No. 15 Wallace, 1" cap.
Dbl. Seamer, Swaine, 36" cap.
Compressor, Herron-Bury CCB, 14x9x8", 6' tank, 20 HP mtr.
Hammer, 50-lb. Little Giant,
Jacks, Lever Lift, 15 ton J. C.
Planer, 30"x30"x8' Wheeler
Roll, Corrugating, 10' Robinson
Screw Mach., No. 2 J. & L.
Welders 2½, 5, 7½, 10 K W
Dyer spot
Valve Refacer, ½" Black & Decker

Brown Mchy. Co., 2333 N. Ninth St., St. Louis, Mo.

OTT MACHINERY SPECIALS

AUTOMATICS:
Brown & Sharpe No. 00 & 19
Cleveland, Model M, 4½" Chucker, M.D.
Cleveland, Model B, ⅞ & 1¼"
New Britain, No. 22
Gridley, Model F, 4 spindle, 1¼"
Gridley, 2¼ & 3¼" Single Spdle.
Automatic Threading Lathes, 13"x6' G.H.

BORING MILLS, 54" Niles, 2 Swivel Heads

DRILLS, Edlund, No. 1A, 4 spdl. P.f. No. 3 M.t. M.D.
Baush & Natco Multiple spindles
Fosdick, 3½' Radial
Henry & Wright, 1 to 8 Spdl., No. 2 mt.

GEAR CUTTERS, Brown & Sharpe No. 4-48"
Fellows No. 61 Shaper

GEAR HOBBERS, Barber-Colman No. 12

GRINDERS, B. & S. No. 3 Universal
Landis, 10x24" Self Contd.
Landis, 16x66" Plain
Norton, 16x36" Crankshaft
Norton, 6x32, 10x18 & 24" Plain
Cincinnati Face Mill, Excello M.D. spdle.

LATHES, Hendey, 12"x6, 14"x5 & 18x10'
Hamilton, 16"x6' Cone, Q.C.
National, 18x8' Cone, Q.C.
Schumacher & Boye, 24"x10' Cone, Q.C.
Acme Turret 3¼x36" M.D.
Steinle Turret, 6¼" hole, M.D.

MILLS, Becker, Vertical, 30" Rotary Table
Briggs Type A & B Mfg.

PRESSES, No. 94 Bliss, Solid Back
No. 68N Bliss Double Action
No. P 3 &4, PG 2 & 5 Fer., Solid Back
No. 74 & 75 Toledo Open Back
No. 44P Toledo Horning, M.D.
Niagara No. 1 to 6 O.B.I.
Cleveland No. 152D, Dble. Crank, 30x75" Bed, Tie Rod, Sgle. Geared, 4" Shaft, 4" Stroke, M.D.

PROFILERS, P. & W. No. 13 Single Spindle

TAPPERS, No. 1, 2 & 2X Garvin
6 Spdl. Holmes Tilted No. 3

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548 Second Ave., DETROIT, MICHIGAN

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MOST MODERN

LARGE PRESS

EVER OFFERED IN THE USED MARKET

CLEARING CRANKLESS 4-POINT SUSPENSION TYPE TRIPLE ACTION PRESS

- All Steel Construction
- Self-Contained
- Motor Drive
- All Gears Enclosed Running in Oil
- All Drives and Ram Adjustments Operated from One Control Board
- Bed 84"x133"

THIS PRESS IS OPERATING NOW! CAN BE SEEN UNDER POWER!

Additional Double Crank Presses Available!

No. 268¼-C TOLEDO 87" bet. housings; bed 60"x96", tie rod; str. of plung. 28". Wgt. approx. 200,000 lbs.

No. 409 BLISS TOGGLE 108" bet. housings; bed 60" x 108", tie rod; with air cushions; str. of plunger 31"; Wgt. approx. 215,000 lbs.

No. 6010¼ HAMILTON Single geared; bed 60" x51"; Friction clutch; 10¼" shaft

No. 158-B CLEVELAND 11" shaft. 72" between housings

No. 23J BLISS. 6" str., 4" shaft. 103" bet. housings

No. 154-F CLEVELAND; tie rod; 5" str.; 72¼" between housings

No. 660 VERSON All Steel 60" bet. housings 6" shaft; 8" stroke with air cushions

No. 206-F TOLEDO Gap Frame; Bed 102"

—SPECIAL ITEMS—

BORING MILLS—VERT. 72", 50" Bullard, 24" Bullard; 30", 60", Colburn rapid traverse vert.; 42" Niles

9'x7'x25' Pond Planer 101" bet. housings 2 heads on rail, 2 side heads mtr-dr.

ALLIANCE BENDING ROLLS 1—20 Ft. Long Dia. top roll 18¼"-Lower rolls 18" each-Drop end housing—hydraulically controlled—motor drive —Est. weight 420,000 lbs.

SHEARS POWER 16 Ft. Tol. ¼" cap. 15" gap

NEWBOLD PLATE LEVELLER AND STRAIGHTENER 98" wide; 13 rolls and 2 pinch. Motor drive with 75 H.P. A.C. motor

30' Birdsboro Hydraulic Pwr. Press Brake or Forming Press; Cap. approx. ½" plt.

INTERSTATE
Machinery Co., Inc.

1449 WEST PERSHING ROAD PHONE YARDS 5800 CHICAGO, ILLINOIS

EMCO REBUILT

BROACHING MACHINES

Cincinnati Rotary Broach, m.d.
No. 1 J. N.LaPointe, belt
No. 2 LaPointe of Hudson, belt
No. 2 J. N. LaPointe, m.d.
No. 3 J. N. LaPointe, double, belt
No. 3B J. N. LaPointe, m.d.
No. 3B J. N. LaPointe, belt
15 ton Hercules, m.d.

MILLING MACHINES

No. 4 Cincinnati Plain, rect. overarm, m.d., Timken Bearings, N.S. spindle
No. 5 Cincinnati Plain, rect. overarm, m.d., N.S. spindle
No. 13B Brown & Sharpe Plain, s.p.d.
No. 28 Ohio Plain, cone
48" Oesterlein Tilted Offset, m.d., N.S. S., Timken Bearings
40" Oesterlein Tilted Rotary, m.d.
No. 2 Garvin Lincoln Type, belt
Carter & Hakes Mfg. Type, belt
Newton C17 Vertical Slab Miller, m.d.
C66A Newton 3 spindle Continuous, m.d., 48" dia. table
Gooley & Edlund Briggs Type, belt
Putnam Briggs Type, belt
30"x28"x8' Ingersoll Planer Type, m.d., 3 spindles

PLANERS

24" Cincinnati Crank, m.d.
36"x36"x10' Cincinnati, belt, 3 heads
36"x36"x10' Whitcomb-Blaisdell, 2 heads, belt
36"x36"x13' Niles, belt, 1 rail, 1 side head
42"x42"x16' Rockford, variable speed m. d., 4 heads
42"x42"x20' Ohio, m.d., 2 heads

AUTOMATICS

⅞" Model A Cleveland
1⅛-1¼" Model B Cleveland
1¼" Hartford
2¾" Cleveland Model A
6" Cleveland Model A
No. 5A, 6A, 6D Potter & Johnstons
No. 23, 24 New Britain Automatics

GRINDERS

No. 12A Bryant Hole & Face, 2 motor drive, late type
No. 6 Bryant Internal, belt
12x48" Modern Universal, belt
No. 1 Fraser Lapper, belt
No. 3 Brown Sharpe Planer Type, belt
No. 3 Diamond Surface, belt
18x48" Diamond L.D. Face, m.d.
30x84" Diamond H.D. Face, m.d.
54" Bridgeport Knife, belt
60" Bridgeport Face
No. 500 UK C.-H. Travel. Wheel Knife, md.
No. 1 Cincinnati Univ. Tool & Cut., m.d.
No. 1 Cincinnati Universal, belt
No. 4, 5, 31 Oliver Mtr. Driven Drill Point.
No. 23 B. & S. Gear Cutter Grinder, belt
Gisholt Universal Tool, belt
Gleason Cutter, belt
Gould & Eberhardt Gear Cutter, belt
Yankee Drill, belt
Landis Chaser, belt
6x32" Norton Plain Cylindrical, m.d.
No. 14—10x18" Brown & Sharpe Plain
10x24" Landis Plain Self-Contained, m.d.
10x30" Queen City Pl. Self-Contained, md.
10x36" Norton Plain, m.d.
10x50" Norton, Plain, m.d.
10x52" Landis Plain Self-Contained, m.d.
12x18" Cincinnati Plunge Cut, m.d.
12x36" Cincinnati Plain, belt
12x36" Modern Plain Self-Contained, m.d.
12x42" Landis Plain, belt
12x48" Modern Plain, m.d.
12x72" Cinc. Plain, m.d., hydraulic feed
No. 1 Gardner Disc, m.d.
No. 4 Gardner Disc, belt
No. 6 Diamond Disc, belt
No. 6 Gardner Disc, m.d.
No. 20 Gardner Comb. Disc and Roll, m.d.
No. 51 Besly Disc, m.d.
No. 120 Gardner Disc, belt

PUNCHES AND SHEARS

Buffalo Armor Plate Slitting Shear, Punch & Bar Cutter, m.d. size 10 IW
Cleveland Model EF S.E., 36" throat
No. 6 Long & Allstatter S.E., 9" throat
No. 6 Long & Allstatter D.E., 24" throat
No. 2 Niagara Bench Type Hand Operated

SHEET METAL MACHINERY

No. 2 Southwark Rotary Shear, m.d., 30" throat, 8 ga.
No. 34 Lennox Rotary Bevel Shear, cap. ¾", belt
Southwark Rotary Shear, cap. ⅜", has 36" throat
Quickw. Circ. Shr., 30" throat, 16 ga., belt
McCabe Pneumatic Flanger, ½" cap.
7' Robinson Hand Brake, 18 ga.
No. 22 Williams & White Eye Bender, m.d.
8' N-B-P Hand Flanger, ¼" cap.
10' N-B-P Hand Flanger, ¼" cap.
No. 1 Campbell Nib., belt, cap. 3/16", has 6" throat
No. 2 Campb. Nib., m.d., cap. ⅜", has 12" throat
No. 10A Quickwork Double Seamer, belt
Magee Sheet Metal Wir. & Edg. Mch., m.d.

TAPPING MACHINES

No. 1 Garvin Knee Type, belt
No. 2 Garvin Automatic, belt
No. 2 Garvin Automatic, m.d.
No. 2X Garvin Automatic, m.d.
No. 2X Garvin Automatic, belt
Gaterman Oscillating Pneumatic, belt
½" Rickert & Shaffer Vertical, belt
No. 5 Webster & P. 5 spdl. Nut Tap., belt
6 spdl. 1" Acme Semi-Auto. Nut Tap., belt

PARTIAL LISTING ONLY

THE EASTERN

1001 TENNESSEE AVENUE,

MACHINE TOOLS

RADIAL DRILLS

3' Mueller, gear box
3' American Sensitive, cone
3' Carlton Sensitive
2½' Avey Sensitive
4' Hammond Sensitive
4' Cincinnati Bickford, motor drive
4' Niles-Bement-Pond Semi-Universal, m.d.
4' Ryerson Plain, gear box
5' Bickford Plain, d.c. m.d.
5' Dreses Plain, gear box
5', 6' N.-B.-P. Semi-Universal, gear box
5', 6' N-B-P Semi-Universal, d.c. m.d.
5' Prentice Plain, cone
6' Dreses Plain, gear box
7' Dreses Plain, gear box
7' Fosdick Plain, cone

GEAR CUTTERS AND HOBBERS

No. 61, 62, 645 Fellows Gear Shapers
6, 18' Gleason Str. Tooth Bevel Gr. Gen.
16" Cincinnati Hobber, m.d.
No. 1 Lees-Bradner Gear Hobber, m.d.
No. 3-26" Brown & Sharpe Cutter
No. 3-26" Cincinnati Gear Cutter
No. 3 Heavy Brown & Sharpe Gear Cutter
No. 5A Lees-Bradner Gear Generators
No. 6-60" and 6-72" B. & S. Gear Cutters
Gleason Spiral Bevel Gear Rougher, s.p.d.
Gleason Bevel Gear Tester, belt
Cross Gear Tooth Rounder, belt
Rochester Gear Tooth Rounder, belt
Schuchardt & Schutte Gr. Tooth Rdr., belt
No. 1 Whiton Full Universal Spur & Bevel Gear Cutter, belt

MULTIPLE SPINDLE DRILLS

2 spindle Textile Horizontal, m.d. in base
3 spindle 20" Barnes Gang
4 spindle No. 2 Colburn Mfg.
4 spindle No. 2 Foote-Burt
4 spindle No. 4 Foote-Burt
5 spindle 24" Barnes All-Geared Self-Oil.
6 spindle National Acme Automatic Horiz.
6 spindle 21" Hoefer Gang
6 spindle Niles No. 4
No. 1 Pratt & Whitney 2 spindle Gun Bar.
No. 3 Baush Multiple, 16x30" rect. head
No. 5 Fox Multiple, 24" round head
No. 7D Moline 2 spindle Hole Hog
No. 14 Natco Multiple, 16x24" head
No. 18, 30 Natco Multiple, rect. head
No. 15 HC Fox, No. 26C Fox
No. 25 Baush
D31 Fox, 25" round head

TURRET LATHES AND SCREW MACHINES

No. 1L, 2L, 3L Gisholts, m.d., chucking
No. 3 Acme Full Universal, cross sliding turret, m.d.
No. 4R Acme Universal, ram type, m.d.
3x36" Jones & Lamson Steel Hd., bar, m.d.
3x36" Jones & Lamson Steel Head, chucking, m.d.
No. 0 Brown & Sharpe Hand, cone
2¼x24" Jones & Lamson Geared Head, m.d., bar (3)
3x36" Jones & Lamson, chucking, m.d.
3x36" Jones & Lamson, bar, m.d.
2 spindle 3x36" Jones & Lamson, chucking
3¼x40" Greenlee Flat Turret, cone
16' Warner & Swasey, cone
21", 24" Gisholt, tilted turret, cone & m.d.
26" Libby Type C geared head, m.d., 7½" hole

BOLT THREADING MACHINES

9/16" Landis 2 spindle, m.d.
1" Acme 2 spindle, cone
1" Acme 3 spindle, cone
1½" Acme 2 spindle, m.d., lead screw
1½" Landis, cone
2" Landis, m.d.
No. 11S Rickert-Shafer Auto. Threading Machine, m.d.

GEARED HEAD ENGINE LATHES

14"x6' Lodge & Shipley, taper, relieving attach.
16"x8' Reed
18"x8' American, taper (4 in stock)
18"x10' American, taper
18"x12' American, taper
18"x15' Lehmann, taper
20"x8' American, taper
20"x10' American, taper
20"x14' Hendey, taper
24"x12' American, taper
24"x16' Axelson, taper
24"x16' Lodge & Shipley, taper
24"x18' Lodge & Shipley, taper
25"x18' LeBlond, taper
26"x16' Bradford, taper
26"x18' Bridgeford, taper
27"x18' LeBlond, taper
27"x21'9" Bridgeford, taper
36"x22' LeBlond

CONE HEAD ENGINE LATHES

13"x6' Willard
14"x6' Bradford, draw-in attach.
16"x6' Bradford
18"x6' Bradford
16"x8' Bradford
18"x8' Bradford
18"x8' Mueller, taper
18"x10' Bradford
18"x10' Schumacher-Boye
18"x10' Springfield
18"x12' Barker
18"x12' Monarch
18"x14' LeBlond, taper
19"x8' LeBlond, taper
19"x12' LeBlond, taper
20"x10' Davis
20"x10' Lodge & Shipley
20"x10' Pond
21"x8' LeBlond, taper
21"x10' LeBlond
21"x12' Bradford
21"x16' LeBlond, taper

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Left—100 Series

Left Hand-Reverse Image, Right Hand Shown

Tool No. RH	LH	Shank Size
R-100	L-100	¼x¼x2
R-101	L-102	5/16x5/16x2¼
R-103	L-104	⅜x⅜x2½
R-105	L-106	7/16x7/16x3
R-107	L-108	½x½x3½

Below—300 Series

Tool No.	Shank Size
300	¼x¼x2
301	5/16x5/16x2½
302	⅜x⅜x2½
303	½x½x3½

Right—200 Series

Tool No.	Shank Size
200	¼x¼x2
201	5/16x5/16x2¼
202	⅜x⅜x2½
203	7/16x7/16x3
204	½x½x3½

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16"x8' Carroll-Jamieson Q.C.G.—Cone Dr.
16"x8' LeBlond Q.C.G.—Cone Drive
18"x10' LeBlond Quick C.G.—Cone Drive
22"x14' Lodge & Shipley Q.C.G.—Cone Dr.

MILLING MACHINES

No. 2 Rockford Universal—Motor Drive
No. 1B LeBlond Plain Mill—Cone Drive
No. 1 Knight Vertical Mill—Hand Feeds

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25" Smith & Mills Self Lubricating M. Dr.
24" Gould & Eberhardt Back Geared—C.D.
24" American Back Geared—Cone Drive
20" Gould & Eberhardt—Single Pulley Dr.

SCREW MACHINES

No. 0 Brown & Sharpe Hand Feeds—C.D.
No. 1 Foster Hand Feed—Cone Drive

GRINDERS

No. 78 Wilmarth & Marmon Auto. Sur. MD.
No. 3 Brown & Sharpe Cutter-Reamer M.D.
No. 1 Gardner Disc Grinder

DRILL PRESSES

1 to 6 Spindle Allen, Avey and Leland Gifford—Belt and Motor Drive

PLANERS

36" Cleveland Rotary Metal—Motor Drive
24"x24"x6' Gray Planer—Single Head
24"x24"x6' Lodge & Davis—Single Head
42"x42"x12' Bedford Openside Stone M.D.

PUNCH PRESSES

No. 91B Toledo Double Crank—3" Stroke
No. 60 Bliss Rack & Pinion Press
No. 84S Bliss "Stiles"—Motor Drive
No. 2C Bliss OBI—With Automatic Roll Fd.
No. 4 Loshbough & Jordan OBI—3" Stroke

SPOT WELDERS

122 KW Federal-220-60-Length Arm, 36"
13 KVA Taylor Winfield 440 Volt 7½" Arm
15 KVA Taylor Winfield 440 V. 21½" Arm

MISCELLANEOUS

No. 0 Mitts & Merrill Keyseater
6"x6' Peerless High Speed Hack Saw
No. 1½ American Broach—Belt Drive
48" Hendley & Whittemore Bend. Rl 10 Ga.
10'-16 Ga. Dreis & Krump Hd. Bend. Brake
Acme Three Head Bolt Cutter—Cone Drive
No. 1 Gray Nibbler—Belt Drive

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Valley No. 2 univ., div. head, p. fds.
Cinc. No. 3, univ., div. head, 3 p. fds.
Garvin No. 3, univ., div. head, 3 p. fds.
Brown & Sharpe No. 4, div. head, 3 p. fds.

LATHES

14"x6' Monarch, q.c.g.
16"x6' Davis Lathe, q.c.g.
18"x10' Amer. Tool Lathe, qcg., dir. m. dr.
18"x10' Hendy Lathe, q.c.g.
26"x10' Whitcomb Blaisdsell Lathe, q.c.g.
28"x14' Putnam Lathe
48"x20' Fitchburg Lathe

TURRET LATHES

No. 2½ Garvin, 1½" cap., p. fd.
No. 5 Acme, 1½" cap., p. fd.
No. 5 Foster, 1-⅞ cap., p. fd.
No. 7 Bardons & Oliver, 2" cap., p. fd.
No. 8 Bardons & Oliver, 2¼" cap., 2 p. fds.
Jones & Lamson, 3x36, s. p. drive
Gisholt, 3½" cap., 2 p. fds.

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Binsee Horizontal Boring Mach., spindle 2½", table 48x24
42" Colburn Bor. Mill, 12 spds., 2 gear box.

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18" Gould & Eberhard Shaper
24" Gould & Eberhard Shaper
20" Steptoe Shaper
Betts Planer, 36x36x12', 2 swiv. heads

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12x36" Cinc. Grinder, univ., p. fds. thru gear box
9x30" Brown & Sharpe, cyl., plain

MISCELLANEOUS

Hilles — Jones, 1" cap., 36" gap, Shear & Punch
Single Frame Hammer, 200 lbs., cap., m-d.
3' Mueller Radial Drill
Peerless Hack Saw, 18" blade
No. 24 Toledo Power Press, geared, 5" str.
No. 4 Ferracute Power Press, 18x30" table

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BRAKES—D. & K., 5' Box & Pan, 14 ga. Keene 10' 16 ga. Toggle Press.

CUT-OFF MACHINE—Davis 6" cap.

DRILLS (RADIAL)—Fosdick4', Carlton 4' all gear box dr.; Hammond 4' sensitive; Mueller 4½' q. box; Morris 3' Gr. Box

DRILLS (H. S. B. B.)—H & W 2, 4, 5sp.; Sipp 1 & 2 sp.; Allen 2 & 6-sp.; Avey, Demco, Lel-Gif. 1-sp.; Avey 2-sp.

DRILLS (MISC.)—Defiance Hvy Duty 2" cap.; Hamilton 42" S. H.; Barnes 20" & 24" 1-sp. & 20" 4-sp.; P W No. 12 Multi-Sp.; Natco 20 sp. Rect. head; P. & W. 24 sp. rectangular head Adj.

GEAR CUTTERS—B & S 26" s. p. d. automatic spur; Cincinnati 36" gear cutter. G. & E. 48" gear Cutter.

GRINDERS—P & W 12" vert. surf.; Cin. No. 2 & B. & S. No. 12 univ. tool, B & S Nos. 11&16 pl. ; B & S No. 2 and Abrasive No. 33 Surf. Heald Nos. 60 & 65 Int.; Landis 10x30" Plain; B & S 10x48"; Badger No. 220, auto. d. e., opposed disc (4); Norton 10" x 36"; Diamond No. 2 Auto. Surf.; Ott 5"x18"; Landis No. 3 Univ.; Cin. 12x36" pl.

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KEYSEATERS—Mitts & Merrill No. 5 vert. Davis No. 1; M. & M. No.0; M. & M. No. 2.

LATHES—Monarch 16"x10' M.D.; Lehmann 18"x9'; American 34"x18' Q.C.G. M.D. Hvy.; Amer. 22x8'; Davis 22"x10'; L & S 20"x10'; S-B & E 20"x10' q. c. q; Flather 22"x10'; LeBlond 16"x8'; Gleason 45"x12'; Monarch 16"x8' (2); Ryerson 20x10', m.d.; S.B.E. 30"x12' Q.C.G. Hendey 16"x8' C.H.; Hendey 18"x10' grd. hd.; Sidney 18"x8' and Flather 16"x8'. L. & S. 16"x8' M.D.

MILLING MACHINES—Ohio No. 29, Ohio No. 20, Hendey No. 3, B & SNo. 3, LeBlond No. 3H, Cin. No. 1 s.p.d. Plain; LeBlond No. 4 M.D. C.D. & Cleveland; No. 2, s.p.d. Plain; Owen Duplex; Ingersoll M.D. Slab Miller 4 hds.; Newton Vert. with rotary table; Becker No. 2 Vert.; Ohio No. 24 Plain; Rockford No. 0 Plain

THREAD MILLERS—Smalley General No. 23-A; Moline No. 10

PLANERS—Pond 32"x34"x10'; Sellers 36x 36x12'; Pease 26"x26"x9'; Pond 54"x54" x12' 4 hds.

PIPE MACH.—Williams 6" cap.

PUNCH PRESSES — Ferracute No. P-4; Barouth No. 3 & No. 4 O.B.I.; Bliss No. 62; Toledo No. 5; Toledo No. 31 & No. 32; Fer. No. EGF 52 Coining; Willard No. 4A o.b.i.; Swaine No. 38 arch; Cons. No. 24 Blanking; Marsh No. 2

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SHAPERS—S & M, G & E, Ohio, Mt., Q. City, Davis, Cin. 16"; Ohio & G & E 20"; S & M, Q. City, Rock, Cin. 24"; Ohio 26"; Cin. 24" s. p. qr. box; American 24" heavy, b.g. Amer. 15"; Springf. 15"; S.&M. 26", b.g. G. & E. 24", s.p., gearbox; Amer. 20"; Rockf. 24" gearbox.

SCREW MACHINES—8 Hand; B.&S. No. 4 Hand; Gridley 4-sp. ¾"; W & S No. 2

SQUARE SHEAR—D & K 10' 3/16" cap. Ohl 8' 14-ga.

SLOTTER—Barr 12"

TAPPING MACHINES—(2) Garvin No. 2 & 2X Vertical Automatic & Garvin No. 1.

TURRET LATHES—Baush 30" M.D.; Potter & Johnston, 8½x16 No. 10; Libby 24", m.d.; P. & W. 2¼" hole grd. hd.; Greenlee 2¼x26; Brown & Sharpe No. 4

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4" swing x 60" centers Lo-swing; two carriages
34" Gisholt Turret Lathe; 6¼" hole through spindle; two-step cone; taper attachment
No. 116 Detrick & Harvey floor-type Boring Mill; 3⅞" bar; 6x8 floor plate
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20″x10′ Hendey Cone Q.C.
20″x10′ Bradford, Cone Drive, Quick Change.
24″x10′ Bradford, Cone Drive, Quick Change.
24″x12′ American Grd. Hd., A.C., M. D., Q.C.
21″x10′ LeBlond, 3 S.C.D. D. B. G.
26″x48″x22′ McCabe Double Spindle Lathe.
30″x14′ Lodge & Shipley, Cone dr., quick change.
30″x16′ Lodge & Shipley Cone Q.C.
36″x12′ Lodge & Shipley, Cone dr., Trip. Grd. Q.C.
36″x16′ Boye & Emmes Trip. Grd., Q.C.
20″x8′ Lodge & Shipley Pat. Hd. Q.C.
14″x6′ Vernon, Cone drive, Q.C.
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16, 20, 24″ G & E Shapers, cone dr.
16, 20, 24 and 28″ Gould & E. Shapers, S.P.D.
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No. 4 Cinc. H.P. Cone Univ. 3 S.C.D. D.B.G.

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51″ Niles, 2 Hds., M.D.
84″ Pond Vertical Boring Mill.

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4 Spdle. New Britain Chuck. Mach.
Pierce 1″ capacity Bar feed & mtrzd.
5A Potter & Johnson

MISCELLANEOUS

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2½″ Landis Bolt Cutter.
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No. 4A High Speed Riveter New.
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No. 36 Niagara Press New.
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8″ Atkins Saw.
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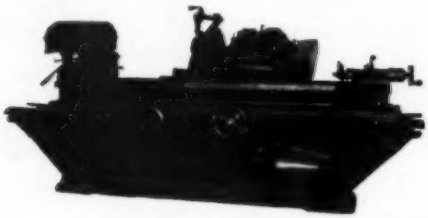

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C-13H NATCO Hydraulic, m.d.
No. 14 NATCO Multiple, with 12 spindles
No. 30 NATCO 24x40" head
No. 40 NATCO Straight Line Multiple Drill
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4¾" Niles Knee Type Horizontal, Motor Drive

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42" NBP Standard, M.D.
44" Baush P. R. T., M. D.

ENGINE LATHES:

48"x21' Pond Heavy Duty
36"x27' Pond Two Carriages
36"x27' Gleason
20"x14' Cisco, Geared Head
20"x14' Walcott Geared Head
20"x10' American Geared Head

GEAR CUTTERS:

36" Gould & Eberhardt, M.D.
60" Gould & Eberhardt, M.D.
72" Gould & Eberhardt, M.D., (2)
No. 12 Barber-Colman Hobbers
Nos. 3, 6, 62 Fellows Gear Shapers

MILLERS:

2—No. 12 Brown & Sharpe Manuf. Millers
No. 24 Brown & Sharpe Plain
No. 2-M Potter & Johnson Vertical
No. 6-62 Becker Improved Vertical
No. 14 Garvin Planer Type Vertical
No. 15 Garvin Planer Type Vertical
60" Garvin Duplex Miller
24" Cincinnati Duplex Miller
28" Cincinnati Semi-Automatic
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P. & H. Vertical Key Seat

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42"x42"x12' Cincinnati, 2-Heads, Reversing Motor Drive (2)
42"x42"x12' Pond, 2-Heads, Reversing Motor Drive (2)
42"x42"x16' NBP 3-Hds., A.C. M.D.
60"x60"x14' Niles 4-Heads, Reversing D.C. Motor Drive
62"x62"x30' Gray, 4-Heads, Rev. D. C. M.D.
72"x72"x12' Putnam Extra H.D., 4-Heads, Rev. D. C. M. D.
72"x72"x32' Niles 4-Heads, Reversing D.C. Motor Drive
72" Morton Portable Planer, M. D.
84"x84"x20' Niles 4-Heads, Reversing D.C. Motor Drive
96"x96"x15' Niles 4-Heads, Reversing D.C. Motor Drive

MISCELLANEOUS:

20"x96" Landis Grinder
24"x96" Landis Grinder
30"x240" Landis Grinder
84" Diamond Face Grinder H. D.
48" Morton Keyway Cutter M. D.
8" Stoever Pipe Threader
500 ton NBP dbl. Carwheel Press

Special: 2-9" Spindle Ingersoll Facing and Slotting Millers, M.D.

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NO. 2B HENRI HAUSER JIG BORER, MTR. DRIVE. FULLY EQUIPPED.

16"x6' and 16"x8' SEBASTIAN 8-SPEED GEARED HEAD TIMKEN BEARING LATHES, MOTOR IN BASE, NEW.

DRILLS

No. 3 Avey, high speed 12" overhang.
No. 22 Natco Multiple 24 Spindle Rect. Head, 13½"x31" area.
No. 13 Natco, 16 Spindles.
24" Hoeffer Sldg. Hd. Tap. Att.
20" Barnes all-grd.
16" Superior, H. S., B. B.
1 & 2 Sp. Demco, H.S. B. B.
No. ½ Avey Bench Drill.
2 Spdle. Avey H. S. B. B.
1 & 3 Sp. Allen, P. F. & T. A.
No. 1&2 Leland-G. b., tap Att.
4' Western Mfg. Type, Plain Radial, M. D.

LATHES

24"x12' Schum. Boye q. c. g.
24"x10' L. & S. Q. C. G, B. G.
8"x18" Porter Cable, collets.
16"x8' Greaves Klusman Grd. Hd., Q. C. G.
16"x12' Hendey Q. C. G., T. A.
14"x10' Hendey Q. C. G., T. A.

LATHES, TURRET

No. 2 Foster, wire feed.
No. 2 Foster b. g., wire feed.
No. 3—18" Milhollond power fd. to turret, air chuck.
No. 1 Foster Hand.
No. 3 Smurr & Kamen Hand.

GRINDERS

No. 1 Cincinnati, tool & cutter.
No. 1 B&S Univ. Belt Drive.

MILLING MACHINES

No. 0 Bristol.
28" Cinc. Semi-Auto. Dupl. B.D.
No. 2 P & W Hand.
No. 3 Becker Vertical.
No. 1 Kempsmith Univ., B. G.
6"x48" Pratt & Whitney Thread.
No. 33 Kempsmith Plain, M. D. 13x67" Table.
No. 4 Becker Vertical, Back Gr.
No. 2V Reed Prentice Vert. MD.

PRESSES

No. 1 Bliss Cam, Fly.

SHAPERS

25" S&M B.G. Crank, M.D. gr. b.
24" Stock. b. g. crank, M. D.
24" Steptoe B. G. Crank, SPD thru Gear Box.
20" Steptoe b. g. crank.

MISCELLANEOUS

Bolt Cut., 1" Landis Lead Scr.
Die Filer, No. 5 Thiel, m. d.
Gear Cut., No. 3—26"—B. & S.
Riv. Hmrs., 1½B, 2A, H. D., 3A, 3A H. D., & 5A Hi. Spd.
Riv. Spin. ⅜" Linley, M. D.
Saw, 6x6 Peerless Hack.
Saw, No. 1 Marvel Hack.

George M. Bernstein & Co.

12 SO. CLINTON STREET CHICAGO, ILLINOIS

BORING MILLS, Horizontal

4½" bar Bement Miles Knee Type
6" bar No. 3 Barrett M. D.

BORING MILLS, Vertical

14'-20' N.B.P. 3 M.D.
84" Betts, Heavy 77" swing
54" Bullard, P.R.T.
51" Bullard, P.R.T.
42" N.B.P. Car Wheel Borer

DRILLS, Radial

3' Cinci. Bickford, S.P.D.
5' N.B.P. Univ. M.D.
5' Western S.P.D.
4' Dreses Plain
4' Western S.P.D.
No. 13 P. & W. Multi
No. 13 Natco Multi
36" Cinci. Bickf. Uprights, MD.
28" Cinci. Upright T.A., M.D.
24" Superior Upright
22½" Barnes Upright
Baker Type M. Tapping
2 spin. Hoefer, 21"
Bausch No. 30 Multi spin. 30" round head 8 spin.

GRINDERS

3"x18" Norton, Self Cont.
6"x20" Landis, Hyd. Feed
15"x15"x96" Norton Open-side Surface, M.D.
16"x68" Landis Crankshaft
No. 6 Landis Cyl. Grinder
No. 3 Landis Universal
No. 2 Sellers Univ. Tool
18" Besly No. 26 Disc
20"x96" Landis Cyl. M. D.
20'x96" Landis Univ.
20"x216" Landis Cyl. M.D.
24"x 96" Landis Cyl. M. D.
30" x 240" Landis Roll M. D.
No. 52 Greenfield "Hydroil" Int.
No. 55, 60 and 65 Heald Cyl.
90" Bridgeport Shear Knife

LATHES

9"x20" Porter-Cable
12"x8' Davis, M.D.
14"x6' Monarch Q.C.G., Cone
16"x6' Putnam, L.C.G.
16"x6' Sidney, Q.C.G.
16"x8' South Bend, L.C.G.
17"x6' LeBlond, 3 cone
18"x8' Whitcomb Bl. Grd. Hd.
18"x12' Amer. 3 cone, Dbl. Grd.
19"x12' LeBlond Grd. Hd.
20"x14' Monarch, Q.C.G.
21"x18' LeBlond, Q.C.G., Cone
22"x12' Amer. 4 cone
22"/24"x12' L. & S., Q.C.G., M.D.
24"x10' Pittsbgh., Q.C.G., Cone

LATHES (Continued)

24"x10' Amer. Grd. Hd.
24"x12' Putnam Grd. Hd., M.D.
24"x12' Reed Prentice Grd. Hd., T.A., Q.C.G.
24"x15' N.B.P. Q.C.G., T.A.
24"/32"x24' LeBlond Q. C. G. Cone, raised in sand
26"x11' Wicks Heavy Cone
28"/48"x11' Harrington Gap, M.D.
28"x12' Lodge & Shipley, M.D.
30"x12' L. & S., Cone, Q.C.G.
30"x16' N.B.P. Axel & Journal, Center Drive, M.D.
32"x18" Fifield, triple grd.
33"/47"x16' Putnam, Cone
36"x14' Rahn Larmon, Q.C.G., Cone
36"x25' Pond, 2 carr., Tri. Grd.
36"x27' Gleason, F. Plate Dr.
42" N.B.P. Center Dr. Whl.
48"/60"x14' Putnam, Heavy
48"x16' Fifield Cone
48"x20' Bement Miles Cone
90" N.B.P. Heavy, Wheel
Peerless Banding Lathe, M.D.

MILLERS

No. 3 Cincinnati Vertical
No. 3 Newt. Miller, 30"x30"x6'
No. 3 Ingersoll Knee Type Vert. & Horizontal Spindle
No. 4B Becker Vert.
No. 5 Brown & Sharpe, Plain
No. 6 Becker Vert. M. D.
No. 6 Whitney Hand
28" Cincinnati Semi Auto
42"x42"x8' Bement Pond, Adj. Rail Miller, 4 hds., hd.
No. 6 Jackson Die Sinkers (3)
No. 1 Standard Hand

PLANERS

60"x60"x30' Gray, 4 hds., reversing motor drive with motor
60"x60"x14' Niles 4 hds.
48"x48"x20', 2 heads
42"x42"x16' N.B.P., M.D.
36" Newton Rotary, M.D.
36"x36"x12' D. & H. Openside
36"x36"x12' Ryerson Opens.
26"x26"x8' Gray
24"x24"x12' American

TURRET LATHES

24"x26" P. & W. Grd. Hd.
No. 1B Foster Univ., M.D.
No. 1F Foster "Fastermatic"
No. 3 Bardons & Oliver Fox Lathe
No. 4 Bardons & Oliver Fox
No. 5A Potter & Johnson (2)
24" Gisholt, 6¼" H.S., 2 cone
24" Steinle M.D. 6¼" h.s., (4)
26" Steinle M.D. 8¼" h.s.
21"x24" & 2"x36" J. & L.
3"x36" P. & W. Bar
3¼x36" Cinci. Acme, M.D

MISCELLANEOUS

Automatics, ⅜" Clevel. Model A
Automatic, 2¼" Gridley, 1 Sp.
Automatics, 2-⅜" - 3-⅜" Clevel. Model A Sgl. Sp. (2)
Automatics, No. 5A Potter & Johnsons Chuckers (2)
Billet Breaking Mach., Ajax
Bolt Threader, 2" Landis
Bolt Threader, 2" Natl.
Chucking, No. 34 New Brit.
Die Sinkers, No. 6 Jackson (3)
Gear Cutters No. 3 & 4 Adams Gear Hobbers
Gear Cutter, 110" Newton Spur
Gear Gen., 18" Gleason Bevel
Header, 1¼" Acme Rivet
Header, 2" Acme Steel
Jarring Mach., Herman Jolt Mould
Keystrs., Nos. 1 & 3 Bakers
Keystrs., Nos. 4 & 6 M & M, M.D.
Lapper, Norton Type 1C
Oil Groover, No. 1 Garvin
Pipe Machine, 4" Saunders No.4B
Pipe Machine, 8" Jarecki
Pipe Mach. 8" & 12" Williams
Pipe Machine, 12" Saunders
Pipe Mach., 12" Curtis & C.
Pipe Machs. 3" Stover M.D.
Pipe Mach., 2" Bignall Keeler
Press, No. 3A Bliss, Dble. Ck.
Press, No. 61 Spec. V. & O.
Presses, No. 18 Bliss B. & Fl.
Press, 400 ton N.B.P., 96" Horiz., Hyd., Loco. wheels
Press, No. 58 Perkins S.S. Grd.
Press, No. 44 Advance Cam
Punch 54" H & J No. 2 D.E.
Rolls, Angle Bending, 4"x4"x½" Williams & White No. 2
Rolls, 12' Corrugating—Heavy
Rotary Table, 28" diameter
Saw, 6" Avey Milband
Saw, 6" Gorton No. 2B Inter.
Saw, 24" Nutter Barnes Cold
Saw, No. 2B Cochrane Bly 6"
Saw, No. 15 Lea Simplex Cold
Shaper, 14" Steptoe
Shaper, 16" Kelly
Shaper, 36" Morton, railroad
Shaper, 32" Morton Draw Cut
Shaper, 28" Ohio Dreadnaught M.D.
Slotter, 14" Newton
Slotter, 15" Putn., D.C., M.D.
Slotter, 18" Newton, Hvy. D.
Slotter, 24" Dill A.C., M.D.
Swager, No. 6 Langelier, M.D.

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42" Bullard Vertical Boring
14-Spindle Baush Drill, No. 2 taper
No. 12 Pratt Whitney Rect. Head
15-Spindle Baush, 2½" spindles
1-SS Garvin Duplex, Horizontal
24" American Radial, tapping
48" Morris Radial, tapping
60" Western "Leader," tapping
12"x48" Cincinnati Universal Grinder
10"x20" Landis Plain Grinder
16"x50" Norton Plain Grinder
No. 60 Heald Cylinder Grinder

14" Pratt Whitney Surface
22" Pratt Whitney Surface
No. 3 Adams Farrell Gear Hobber
No. 4 Adams Farrell Gear Hobber
5-A Lees Bradner Gear Generator
Sloan & Chase Precision Bench Miller
18"x105" P&W Duplex Miller
No. 10 Niles Vertical Miller
Ingersoll Planer Type Miller
36"x32"x18' Powell Planer
42"x42"x10' American Planer
60"x48"x26' N.B.P. Planer
84"x32"x42' Southwark Planer
36" & 60" Rotary Planers
24" Newton Cold Saw
42" Newton Cold Saw
60" Espen Lucas Cold Saw
52" Ryerson Friction Saw
No. 2 Garbo Saw Table
20" Sellers Crank Slotter
20" Newton Crank Slotter
30" Baker Draw Stroke
No. 3 N.N. LaPointe Broach
1½" Landis Threading
6" Acme Threading
6"x¼" Bending Rolls
10'x¾" Bending Rolls
10'x¾" Straightening Rolls

SIMMONS MACHINE TOOL CORP.
1725 Broadway, Albany, N. Y. Singer Bldg., New York City

NEED GOOD TOOLS? — SEE US FIRST

D-31 Fox multiple drill, rectangular head, 16"x31½" spindle centers. No. 2 Morse taper; 10 spindles, hand and power feed to head.

AUTOMATICS, ⅜-½ & ¾" Model B

BOLT CUTTERS, 2" Landis.

DIES and MACHINES for rect. cans, inc. 61 Ams flanger; 72 Ams double seamer; 126CD Adriance double seamer; 281 Adriance gang slitter; No. 114 Adriance Automatic Double Seamer 10" round cans.

DRILLS, 36" Cincinnati, back geared sliding head, tapping attachment; 4 ft. Dreses plain radial gear box drive; No. 4 Quint six spindle turret drill; No. 4 Morse tapers; 2 sp. Leland Gifford Ball Bearing left H. sp. with tapper

DROP HAMMER, 300 lb. Standard Auto.

ENGINE LATHES, 22"x10' Davis dble. back gear quick change; 38"x14' Fitfield 14" 6' Monarch, plain change; Four 9"x20" Porter Cable Production lathes with back facing attachment.

MILLING MACHINES, No. 3½ Pratt & Whitney duplex, 60" table, 27" extreme between spindles; No. 1 Newton slab, 65" table feed.

TURRET & MONITOR LATHES, 1 3"x36" Jones & Lamson; No. 1 Am. Tool & Mach., Fox Monitor chasing bar.

PLANERS, 24"x6' Pond, one head; 36"x15' Betts two heads.

PIPE MACHINES, 3" Bignall & Keeler; 4" Saunders; both belt drive.

PRESS, No. 5 Marshalltown O.B.I. Press, 3" stroke arr. for Motor

CRANK SHAPER, 20" Walcott B.G.

SAND BLAST, C-36 New Haven 36"x44" Radial Sand Blast Barrel M.D.

SEPARATOR, 3 McKenzie chip production.

WIRE STRAIGHTENER, ¼" Shuster, 10 ft. Cutoff

Many other tools—exceptional "buys"—write for full details.

A. D. White Mchy. Co., 108 N. Jefferson St., Chicago, Ill.
Established 1894

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No. 00 Brown & Sharpe Cut-off
No. 2 Brown & Sharpe
No. 2C Brown & Sharpe
No. 6 Brown & Sharpe
No. 6A Potter & Johnston

BROACHES
No. 3 and No. 4 La Pointe

DRILLS
No. 2 Colburn S.S.
24" Barnes, Power feed
36" Barnes, Power feed
No. 12 Natco Multiple Spindle
No. 5 Fox Multiple Spindle
Natco 3 way Horizontal multi. spdl.

GEAR CUTTERS
No. 12 Barber Colman
No. 6 Fellows
15" Gleason Spiral Bevel
18" Gleason Gear Tester

GRINDERS—Cylindrical
No. 20 Bryant Chucking
16"x50" Norton Crankshaft
No. 2 Erown & Sharpe Universal
18x96 Brown & Sharpe Plain

GRINDERS—Rotary
No. 25 Heald—18" chuck

GRINDERS—Surface
No. 2 Diamond
22x84 Pratt & Whitney

LATHES
8x6" Rivett Precision, C.D.
22"x14' Bradford, geared head
14"x5' Monarch—C.D.
20"x10' American—C.D.
21"x8' LeBlond—C.D.
No. 6 LeBlond Multicut
8x24" Sundstrand—S.P.D.
3½x60" Fitchburg Lo-Swing—G.H.

LATHES—Turret
No. 6 Warner & Swasey—C.D.
No. 3A Warner & Swasey
No. 1B Foster
No. 5 Foster
No. 7 Foster
No. 4½ Bardons & Oliver
No. 7 Bardons & Oliver
No. 9 Bardons & Oliver
No. 10 Bardons & Oliver
2¼"x24" Jones & Lamson
3"x36" Jones & Lamson
26" Libby

MILLS—Boring
No. 3 Binsee Horizontal
42" Bullard Vertical

MILLS—Plain
No. 2B Brown & Sharpe S.P.D.
No. 3 Cincinnati—S.P.D.
No. 21 Brown & Sharpe—S.P.D.
18" Cincinnati—S.P.D.

MILLS—Vertical
No. 4B Becker—C.D.
No. A. B. Becker—S.P.D.

OIL GROOVER
Wicaco Continuous

PLANERS
60"x60"x11' Pond
36x36x14' Detrick & Harvey—Opens.

ROLL FORMING MACHINE
Hamilton—8 stand

SAWS
No. 4 Atkins Band—M.D.

SHEET SHEAR
No. 796 Niagara, M.D.

Indianapolis Machinery & Supply Co., Inc.

1959-69 SOUTH MERIDIAN STREET, INDIANAPOLIS, INDIANA

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AMERICAN 20"x10' Heavy Duty Lathe—cone drive
LODGE & SHIPLEY 20"x14½' and 18"x12' SELECTIVE GEARED HEAD LATHES
ELYRIA 42"x38' Heavy Duty Lathe
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HAMILTON 48"x48"x12' Planer—4 heads
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G. & E. 24", 32" SHAPERS, M.D
BLISS 73½ STRAIGHT SIDE PRESS
BLISS 160 SINGLE STROKE DOUBLE CRANK PRESS
WAGNER HYDRAULIC COLD SAW—cap. 7" round
GISHOLT, 34" TURRET LATHE, 7½" HOLE IN SPINDLE
LEBLOND 25"x16' cone pulley Lathe
CLEVELAND No. 1 Plate Planer 21' capacity

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MOREY MACHINERY COMPANY
410 BROOME STREET. NEW YORK, NEW YORK

MACHINE TOOLS FOR SALE

LATHES

1—36"x16' Springfield engine lathe

TURRET LATHES

1—No. 2A Warner & Sasey universal tur. lathe, single pulley drive all geared hd., serial 113,996, hole thru spdl. 2¾"
1—No. 3B Foster univ. turret lathe, saddle type, s.p.d., all geared head, new in 1927, hole through spindle 5⅛"
3—24" Steinle univ. tur. lathes, s.p.d. all geared head hole through spindle 4"
1—26" Libby univ. tur. lathe, s.p.d. all geared head hole through spindle 7½"
1—21¼"x24" Jones & Lamson flat tur. lathe, s.p.d., all grd. hd., arr. for bar work
1—Jones & Lamson double spdl. tur. lathe, s.p.d., all grd. hd., arr. for chuck work

BORING MILLS

1—62" Colburn vert. boring mill, self-cont. drive, 2 swivel heads on cross rail

MILLERS

1—No. 3 Cinc. Hi. Pwr. pl. miller, s.p.d., all grd. fds. and spds., working surface of tables 53½"x13½"
1—No. 21 Brown & Sharpe automatic plain miller, m.d., all geared, working surface of table 34x11"
1—Model CS Becker Continuous vertical miller, table dia. about 29", s.p.d.
1—No. 2 Garvin two spindle vertical profiler, working surface of table 19"x24"

GRINDERS

1—No. 14 Brown & Sharpe Cyl. grdr., belt drive, 10" swing, 18" grinding length
1—No. 3 B. & S. Universal grdr., 3 mtr. dr.
2—12x36" Cinc. Universal grdrs., 3 mtr. dr.
1—16x80" Cinc. Universal grdr., 3 mtr. dr.

LAURENS BROS. 71st St. & Longview Ave. Cincinnati, Ohio

"FALK" MEANS IN STOCK

AUTOMATICS:

7/8" Cleveland "B" ser. 32543
1¼ Cleveland "A" ser. 25781
2¼ Gridley "F" 4 spindle 8021
2" Nat. Acme "B" 4 spl. 13197
4¼ Cleveland "A" ser. 17258

BRAKES:

8'x14 ga. Hand Bending D&K
8'x18 ga. Hand Bending D&K
3'x14 ga. Box & Pan D&K
5'x14 ga. Box Pan D&K

SHEARS:

10'x¾ Wais & Roos, 24" Gap
8'x3/16 Bliss 18" Gap
8'x14 ga. Stoll
4'x3/16 Niagara No. 748
6'x18 ga. Stoll 15" Gap
No. 0 Buffalo Bar Shear 1¼" Rd. Cap. 1" Sq. 2½x2½x¼ Angles 2½x½" Flats
No. 1 Pels Hand Univ. Iron Wkr.

DRILLS:

Foote-Burt No. 21 Hy. 18" sp. tr.
Cin.-Bick. 28" with Tapping
Baker No. 216 Split Column
Snyder 36" 28" 24"
Barnes 24" 21" B. G. P. F. Sliding Heads
Aurora 24" B. G. P. F. Sl. Hd.

BORING MILLS:

3" Bar Universal Horizontal, Table 24x48, Motor Driven
3 Boring Bars, Perfect condition
36" Bridgeport Vertical, 2 heads
42" Colburn Vert. 2 hds. Rd. Tr.
72" Colburn Vert. 2 heads, Power Traverse

AIR COMPRESSORS:

4½x4½ DeVilbis Vert. Water cooled, (2) 6x6 Bury Horiz.; 6x6 Curtis Twin Vert. water cooled; 9x8 Blaisdell Horiz; 10 x 8 Laidlaw horiz.; 12 x 10 Ingersoll-Rand, E R I, Horiz; 10x8x4 American Tandem 250 lb. Press cap. with intercooler. (2) 14x12x10 American 2 Stage with Intercooler, 500 CFM

BULLDOZER:

No. 4 Williams & White

PRESSES:

No. 166 Consolidated, Dble. Cr., Bed 40x36 6" stroke, Marquette Cushions; No. 5 American Str. Side 75 tons, 3" stroke; No. 37½ Bliss, Straight Side; 75 tons, 4½" stroke; No. 21½ Bliss (2) O.B.I. Geared; No. 18 No. 19 No. 20 No. 20B No. 21 Bliss O.B.I. Plain; No. 2 No. 3 No. 5 No. 6 Niagara O.B.I. No. 3 No. 5 Consolidated O.B.I. No. 4 V&O Motor Dr. O.B.I. No. 2½ V&O.. O.B.I., No. 2 No. 3 American Can; No. 4 Adriance O.B.I. No. 25 Niagara Arch, No. 20 Bliss, Arch, No. 702 Bliss Flat Trimmers (2) 16 Bliss Horn, M.D. No. 1 Bliss Toggle, 3 tons General Flex. 12 Ton Fox Flex. No. 75 Toledo Pl. No. 75 Toledo Geared, No. 6 Waterbury O.B. No. 3 Marquette, Geared, air cushion, No. 5 Greenerd Broach

DRILLS—Sensitive High Speed, Ball Bearing:

6 Spindle Avey No. 2
4 Spindle Avey Leland Gifford, Foote-Burt No. 2 (8)
3 Spindle Avey No. 2
2 Spindle Avey No. 2 No. 3, Leland Gifford No. 2, Henry, Wright No. 2, Edlund No. 2B, Foote-Burt No. 2
1 Spindle Avey Foadick L & G Sipp, H&W, Edlund, No. 0 No 1 No. 2 No. 3 (Buffalo New Drills in Stock)

DRILLS—MULTIPLE:

Nateo No. 11-8 spindles
Fox No. 2-8 spindles
Harrington 12 spindles, drilled for 20, like new

RADIAL DRILLS:

3' Bickford, 3' American, 3' Dreses 3' Mueller
3½ Silver, 4' Dreses, 4' NBP Semi Universal
7' Pond Belt dr. 3' Carlton Ball Bearing, Sensitive, M. D.

SHAPERS:

28" G&E "Invincible" (2) 24" G&E cone, 24" G&E, spd.
26" Smith & Mills, 24" Cincinnati, 24" Stockbridge
20" American, 20" Cincinnati, 16" Smith & Mills
15" Stephen 15" Potter & Johnson, 16" G&E Motor Driven
20" Hendey Friction, 20" Ohio BG, 14" G&E

LATHES:

42"x15' Pond triple Geared, 24"x16' Greaves-Klusman
26"x12' Crawford-Erie, 20"x8' American, M.D.
20"x10' Davis, 21"x8' LeBlond with Turret on Carriage
19x8' LeBlond Heavy Duty Production, 18x8 Mueller
18x8 Chard 18x8 Cisco, 18x8 Hamilton
18x12 Hamilton, 18x12 Prentice 17x8 Sidney
16x8 Cincinnati Taper, 16x8 Cincinnati
16x10 Reed Prentice; 16x8 Reed 16x6 American Inside lead screw 16x6 American Geared Head
16x6 American Cone Ser. 42346, 16x6 Pratt & Whitney
16x6 Lodge & Shipley Geared Head, 16x6 L&S cone
16x6 Monarch, 14x6 Rockford 14x6 LeBlond
14x6 Standard Lathe works 14x6 Monarch
14x6 Greaves & Klusman 13x6 Mulliner-Edlund
13x6 Willard Geared Head, 12x5 Mulliner-Edlund
10"x4½' Pratt &Whitney Toolmakers Lathe, Taper Attachment Draw Bar & 7 Collets, 8"x36" American Watch Co. Precision Bench Lathe, compound, Collets, etc.

MILLING MACHINES:

3A Brown & Sharpe Universal, No. 3 Ohio Plain, No. 2 Cincin. Universal, No. 2 Van Norman, No. 1½ B&S, Plain, No. 1½ Cincinnati Plain, No. 1½ Rockford Plain, No. 1 Kempsmith Universal, (2) No. 1 Kempsmith Plain, No. 4 Van Norman (2) No. 0 Van Norman (2)
4—No. 5 Stark Precision Bench Millers, Plain, mounted on substantial Wood Benches and arranged for motor drive, No. 3 Burke Bench Millers on Pedestals (2); No. 4 Burke Bench Mill with Power feed on Pedestal; No. 1 Toledo Hand Miller, B. Bearing Flywheel on Spindle, No. 6 Whitney Hand Millers (8) No. 4 Hendey Lincoln Production Miller; 16" Geeder & Edlund Briggs Model "A" Production Miller; No. 6 Jackson Vertical Miller and Die Sinker

THREAD MILLER:

6x14 Pratt & Whitney
4" P&W Spline Miller (2)
2" P&W Spline duplex Miller

GEAR CUTTERS

48" Gould & Eberhart
No. 12 Barber Colman
18" Schuchart & Schutte
Whiton Automatic Spur;

RIVETING HAMMERS:

No. 6B No. 5½B H.D. No. 4A No. 4A M.D.
No. 3A H.D. No. 2A No. 1½B Rochester High Speed Hammer Co.
No. 3R Marquette Riveting Press No. 0 No. 80 Grant
15 lb. Bradley Upright 50 lb. DuPont Upright
400 lb. Miner & Peck Belt Drop
200 lb. Bliss Board Drop, Poppet Base; (new)

PIPE MACHINES:

2" Chicago Motor Dr. 2" Jarecki 2" Landis, 4" Curtis 6" Williams "Rapiduction" 6" Jarecki 12" Saunders, Bolt Threaders, 1¼ Landis double head 1" National Geared Head, dble. 2¼" Acme, full set dies

Partial List Only. Send Us Your Inquiries.

FALK MACHINERY COMPANY 18 WARD STREET ROCHESTER, N.Y.

ESSLEY *Machine Tools* **IMMEDIATE DELIVERY**

BORING MILL, 42" Bullard, vertical, with two swivel heads on rail, belt drive.

GEAR SHAPERS, two No. 6 Fellows.

GRINDER, 6"x32" Norton plain cylindrical.

ALLIGATOR SHEARS, Two Lewis Heavy Duty
1 - 18 inch blade capacity 3 inch round
1 - 24 inch blade capacity 5 inch round

RIVETER, Hanna Pneumatic, 30 Ton, 48" Throat, 15" gap, capacity 7/8" Hot Rivets.

ROLL TURNING LATHE, United 42"x20'

Also Many Other Machine Tools
Buy With Confidence

THE E.L. ESSLEY MACHINERY CO
831 W EVERGREEN AVE - CHICAGO, ILL

"Ready to Ship" —B U T

Our stock of machine tools changes too quickly to offer a listing. Send us your inquiries because we are constantly in touch with the market.

MORRIS MACHINERY CO., Inc.

97 Chestnut Street, Newark, N. J.

AVAILABLE!!

MILLS

2-No. 24 Bliss Vert. Die Sinkers with long. pwr. fd. to 24" dia. rotary tbl. Can be used as vert. mills. Fine condition
2-No. 2 Pratt & Whitney and Billings & Spencer Vert. Die Sinkers
18"-28" Cincinnati Automatics
2-No. 33 Kempsmith Production
3-Hendey & Becker Lincoln Type
Horizontal Double End Natco—Garvin Hydraulic Mill & Drill
2A-Becker Vertical—Rotary table

DRILLS

4'-N-B-P. Full Univ. Radial No. 4 MT—4 sp. AC MD with M & control.—Box Tbl. 11" Col. Rev. spdl.
2½'-3'4" Plain Radials MD.
6 spindle Moline Hole Hog with cam fed table
4 spindle Allen—H & W Sens. Hand feed No. 2 MT.
4 spindle H.D. Foote-Burt ream. machine No. 5MT—MD.
3-Fox & Baush Mult. Spindle

LATHES

2-26"-32"x18' Bridgeford oil country type chucks, taper att., steady rest
2-26"x16' Gleason, oil country type, chucks, taper att. etc.
Special H.D. Prod. 6"x20" Cap. Timken spdl. Front & Rear tool slides, solonoid & air controls MD & Mtr. —never used
4¼" Bardons & Oliver Geared Head Pwr. Cut-off machine. Dbl. Slide

TURRET LATHES

26" Libby Geared Head Full Univ. 4½" hole in spindle—chuck, face plates, pot chucks, bor. bars, tools. Rebuilt—SPD.
2-No. 4 Bardons & Oliver for chuck. and bar work. One geared head
2-3"x36" J. & L. 1 & 2 spdl. Univ. 20,000 to 30,000 serials. Air chucks
10 misc. Plain head Hand Screw Machines Bar and chuck
24" Gisholt Univ. Tilted Type Turret Chuck and Taper att.

GRINDERS

No. 50 Heald Hydraulic Internal
No. 60 Heald Knee Type Internal
Churchill Internal—2 motors Power feed—Rebuilt. Fine tool
2-No. 6 Bryant Internal-Extra spdls.
2-6"x15" Fitchburg Plain Cyl.
2-36" Bath Univ. Head and tailstock
1-Modern Plunge Cut Form Cyl. Live ctr.—Hop. fd. Never used MD
No. 3 Diamond Surface—48" travel
No. 11 Brown & Sharpe Pl. & Ctrsft.

MISCELLANEOUS

36"x36"x8' Detrick & Harvey Open Side Planer—2 Rail Heads, 1 Side Head. Self-contained M.D.
2-30"x30"x10' Plnr. 2 hds. G. & O.
No. 30 Z & H Percussion Press. Cap. 900 ton—25" stroke—Tie Rod
75 Ton Henry & Wright Dieing Press —Double Roll Feed & Scrap Cutter Rebuilt—6 weeks delivery
25 Ton Henry & Wright Dieing Press Double Roll Feed
12"-14" Sellers & Bement Vertical Slotters, rotary tables
No. 1 & 2 Baker Keyseaters
No. 2 Mitts & Merrill Keyseater with 32 cutters. M.D.
4 Oil gear Hydraulic Pumps Type QH. Cheap for replacement or parts

Our Engineering Service will aid in the Selection of Good Used Production Machines we have available.

A Well Managed and equipped Department for the Reconstruction of Machine Tools is at your Service.

R. A. VINE'S MACHINERY WAREHOUSE

652 West Willis Avenue **Detroit, Michigan.**

MOSER'S HIGH GRADE UNUSUAL TOOLS

No. 2-A W. & S. Univ. Tur. Lathes, M.D. (3)
No. 3-A W. & S. Univ. Tur. Lathes, M.D. (2)
3" Rochester Table Type Horiz. Bor. Bar, MD.
No. 3B Kearney & Trecker Plain Vert. Milling Machine, power rapid traverse to table
No. 33 Kempsmith Milling Machine
42"x10' Ingersoll Fixed Rail Head Miller
6"x61" Goss & Deleeuw 4-Spdl. Auto. Chucking Machine
Gridley 4-Spindle 1¼" Automatic
New Britain 6-Spdl. 1¼"x7" Automatic
New Britain No. 24 4-Spdl. Auto. Chucker
1" Cleveland Model A Automatic
2" Cleveland Model A Automatic
16" Bilgram Bevel Gear Generators (2)
No. 65 Heald Internal Grinder, arr. M.D.
Oliver Arc Face Mill Grinder, 24" cap.
12"x6', American Q.C.G., D.B.G. Lathe, collets, chucks, taper attachment
14"x8' Davis Q.C.G. Lathe, countershaft M.D.
20"x12' Hendey Q.C.G. Lathe, taper att., pan bed, M.D.
No. 2 Avey Single Spindle Drill
No. 2 Leland-Gifford Single Spindle Drill
No. 3 4-Spindle Avey Drill
No. 130 Pexto Foot Operated Squaring Shear
Dbl. End Rockford Horiz. Bor. & Drill. Mach.
Dbl. End W.F. & John Barnes Drilling Mach.

MOSER MACHINE TOOL SALES — 1608 W. Clybourn St., Milwaukee, Wis.

GRINDERS
No. 3 Univ. D&K, Tool, Cut.
No. 2 Reid, automatic, surf.
No. 3 La Salle, hand
No. 103 Rivett Internal
No. 1 La Salle, hand

LATHES
17x9 Sidney, Q.C.G.
20x10 Walcott, Q.C.G.
22x11 Cisco, Q.C.G.

MILLING MACHINES
No. 0 Stark, prec. type
No. 1 Brown & Sharpe, MD.
No. 1 Steptoe
No. 2 Bristol Hand
No. 2 K & T, div. hd., vise
No. 20 Ohio
No. 25 Ohio, univ., compl.
No. 1½B K & T, S.P.D.
16" Cin. Production vise
No. 3 Ryerson, Gd. Hd., S.P.D., Rapid Pwr. Trav.

MISCELLANEOUS
Brake, 5' D. & K., 14 ga.
Buffing Lathes, 5 & 7 h.p.
Presses, 0's to 3's O.B.I.
Screw Mch. 2½" Cin.-Acme
No. 1 Foster, bar id., collets
No. 8 Marvel Bandsaw,
6" Victor Pipe Mach., dies
Roll, 5' Power Driven, 6" dia., ¼" cap., Initial type
Shapers, 7" to 24"
Shears, 5' Bertsch, gap, overhead drive; 10' Ohl
Keyseater, No. 0 Baker
Broach, No. 2 La Pointe

GILMORE MACHINERY CO., 30 S. Clinton St., Chicago

BOLT CUTTER, 1" double head Acme, b.d.
BOLT CUTTER, 1½" double hd. Acme, b.d.
BORING MILL, 36" Baush, motor drive
BORING MILL, 42" Bullard, motor drive
BORING MILL, 84" Pond, belt drive
DRILL, 20 spindle Natco, No. 2 M.T. head 14"x27"
DRILL, 10 spindle Natco, No. 1 M.T. head 13" diameter
GRINDER, 20"x144" Landis Plain, mtr. dr.
GRINDER, 12"x36" Pratt & Whitney, belt dr.
GRINDER, 12"x36" Modern Plain Cylindrical, self ctd. drive
LATHE, 54"x16' Johnson, motor drive
LATHE, 48"x20' Johnson, belt drive
LATHE, 42"-60"x24' New Haven, belt dr.
LATHE, 30"x20' LeBlond, motorized, q.c.
LATHE, 18"x16' Flather, belt drive, q.c.
KEYSEATERS, No. 5 Mitts & Merrill
NIBBLER, No. 2 Campbell, 12" thr., ⅜"cap.
PIPE MACHINE, ½" to 2" Landis, b.d.
RIVETER, No. 5½B High Speed, cap. ⅝ rivets

THE O'BRIEN MACHINERY CO., 113 N. Third St., PHILADELPHIA, PA.

DRILLS, 2—20" Barnes & Kok. uprights
1—D-25 16 Sp. Fox Mult.
1—4 Sp. Colburn Mfg. 1¼" Cap.
GEAR CUT., 1—11" Gleas. Bev. Gr. Gen.
1—No. 3—36" Brown & Sharpe
1—36" Fellows Gr. Shaper
1—No. 5—60" Brown & Sharpe
GRINDERS, 1—No. 6, 20 Bryant Internals
1—10"x36" Thompson Universal
1—No. 4 Brown & Sharpe Universal
1—No. 1 Webster & Perks, Universal
LATHES, 1—16"x8' L & S
1—16"x8' Prentice
1—16"x10' Springfield
1—20"x8' L & S
1—26"x10' Prentice
1—36x12' L & S
1—36"x20' Le Blond, Gr. Box M. D.
2—24" Gisholts, 6¼" Hole
1—3"x36" Jones & Lamson
1—3"x60" Fitchburg Lo Swing
MILLERS, 2—No. 2 Cinn. C.D. Grd. Fds.
1—No. 1½ American, Vert. Hd.
1—No. 25 Becker
1—No. 1 Standard Engr. Hand
PLANERS, 1—36"x36"x10' Gray
PRESSES, 1—No. 24 Adriance Horning
1—No. 40 Bliss Horning, Grd. M.D.
1—No. 54 Toledo, 45 Tons, Side Shear
2—No. 55 Bliss Cosa.
1—No. 56 Toledo 130 Ton
1—No. 12 Waterbury, 150 Tons Side Shr.
SHAPERS, 1—14" Rockford
1—16" G & E
1—20" G & E, S. P. D., thru Gr. Box

T. R. WIGGLESWORTH MACHINERY, 5123 St. Clair Avenue, CLEVELAND, OHIO

AUTOMATICS

2¼" Gridley Single Spindle
3¼" Gridley Single Spindle
4¼" Gridley Single Spindle

BORING MACHINES

No. 2—3⅛" Bar Rockford
No. 1 Barrett, 3¾" Bar
No. 2 Barrett, 4½" Bar
No. 2 Barrett, 5" bar

BORING MILLS

30" Bullard, 1-turret head
36" Bullard, with side head
42" Niles plain head, turret head
42" Bullard
72" Bickford.

DRILLS

1, 2, 4 Spdl. Leland-Gifford.
No. 2-4 Spdl. Leland-Gifford, Motor Spindles. Power Feed
1, 2, 4 Spdl. Henry & Wright.
No. 2 Colburn, 1 Spindle
No. 4—5 spdl. Foote-Burt.
No. 1 Baush Multiple
No. 3 Baush Multiple
3½' Cincinnati-Bickford Plain
6' Niles-Bement-Pond Universal

GEAR CUTTERS

No. 2 Barber-Colman Hobber.
No. 12 Barber-Colman Hobber.
No. ½, Pfauter Hobber.
No. 3-26" Brown & Sharpe.
No. 4-48" Brown & Sharpe.
No. 5-48" Brown & Sharpe
No. 6-72" Brown & Sharpe.
No. 6-A-72" Cincinnati.
96" Newton Spur Gear
Nos. 6, 61, 62 Fellows

GRINDERS

(See page 296—special advertisement) Hill-Clarke Cylindrical Grinders

No. 70 Heald Internal
16"x32" Landis Crankshaft
No. 4-12"x66" Landis Universal.
8" Arter Rotary Surface
No. 5 Springfield Planer Surface

MFG. LATHES

3½"x36" Fitchburg Lo-Swing.
3½"x60" Fitchburg Lo-Swing.
3½"x108" Fitchburg Lo-Swing.
8"x60" Fitchburg Lo-Swing.

ENGINE LATHES

18"x6' Bradford
18"x8' South Bend
21"x8' LeBlond Universal Turret
21"x10' LeBlond
24"x12' American.
24"x13' Chard.
24"x16' Lodge & Shipley.
24"x22' Lodge & Shipley, Taper Attach.
26"x8' Bridgeford
26"x10' Bridgeford
30"x12' Whitcomb-Blaisdell
20"-40"x10' Rahn - Larmon Geared Head Sliding Bed Gap.
40"x12' Fifield
60" New Haven Triple Geared

MILLERS

No. 3 Becker-Brainard Plain.
5" Pratt & Whitney Automatic
Type "B" Briggs Mfg. No. 33-36" Kempsmith Production
No. 4 Garvin Profiler
No. 5 Brown & Sharpe Vertical.
Model ACS Becker Vertical
24"x24"x12' Ingersoll Adj. Rail.
24"x20' Ingersoll Double Faced
36"x36"x12' Newton Duplex.
38"x44"x20' Ingersoll Slab.
72"x16"x14' Ingersoll Slab.
No. 1 Smalley-General Thread.
No. 4 Lees-Bradner Thread

PLANERS

24"x24"x6' Powell.
24"x24"x6' Rockford.
24"x24"x6' Cincinnati, 2 heads.
24"x24"x12' Gray.
30"x30"x8' American.
30"x30"x8' Powell.
36"x36"x8', 18' Cincinnati.
36"x36"x12' American 2 hds.
42"x42"x12' Liberty
42"x42"x14' Gray, 2 heads.
48"x48"x10' Niles-Bement-Pond, 2 heads.
48"x48"x12' Gray, Reversing M.D.

PRESSES

No. 303 Bliss S.S., Geared.
No. 58 Toledo Nosing.
No. 178 Toledo Toggle Drawing

TURRET LATHES

2¼"x26" Greenlee
3¼"x40" Greenlee
3"x36" J. & L. 2 spdl.
18" Libby
21"x8' LeBlond Universal
21" Gisholt, 3¾" H.S.
24" Gisholt, 6¼" H.S.
24" Steinle, 6¼" H.S.

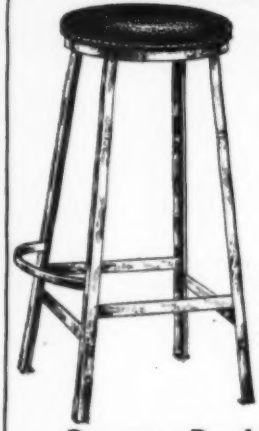
MISCELLANEOUS

15" Hendey Shaper
26" Springfield Shaper
24" Mark Flather Shaper
No. 3-B J. N. La Pointe Broach
8" Landis Pipe Machine
12" Bignall & Keeler Pipe Mach.
60" Quickwork Rotary Shear

HILL-CLARKE MACHINERY CO.

645 W. WASHINGTON BOULEVARD, CHICAGO

NEW FACTORY STOOLS
Immediate Delivery



Sturdy Welded, Steel Frame; Wood Seat; Foot Rest.

24" — $1.90
26" — 2.00
28" — 2.10
30" — 2.20

Passman Brothers
1101 W. Lake St., Chicago, Ill.

Turret Lathes: 1B Foster Geared Head, Universal, Bar and Chuck Feed
Gisholt 21"—Univ. Chucking Work, T.A.
(2) No. 0 B. & S. Wire Feed, Six Hole Round Turret, Six Stops

Milling Machines: No. 2 B & S Univ. Full Equipment
No. 3 Van Norman Duplex
No. 2 Kempsmith Plain
No. 1 B. & S. Universal, Arr. for M. D.
No. 13 P. & W.—1 spdl. profiler

Lathes: Amer. 27x16—8 Sp. Geared Head
(2) Monarch 12x5 Geared Head M.D.
Monarch 14x6 Geared Head M.D.
Monarch 16x8 Geared Head M.D.
American 20x12—3 Step Cone, DBG.-T.A.
Lehmann 20x14—3 Step Cone, D.B.G.
Boye & Emmes 24x16—3 Step Cone, DBG.

Planers: 36x36x10 Whitcomb, 2 Heads
38x42x10 Gray, 1 Head

Radial Drills: Canedy-Otto, 3' Arm, Motor on Spindle

Gear Hobber: 12 H Gould & Eberhardt—S.P.D.

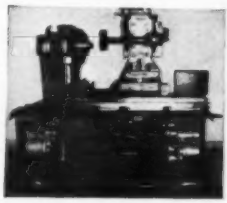
Ironworkers: Pels, Universal, Punch 1¼" through ⅝", Angles 6x6x½
Pels Bar Shear, Capacity 3" Round
Pels Combination Shear, 4"x1-1/6" Flats, 2¼" sq., 6x6x⅝" angles, M.D.

ACME EQUIPMENT CO.
128 S. Clinton St., Chicago, Ill.

We are releasing for sale—

No. 14 BROWN & SHARPE INTERNAL GRINDER with raised TIMKEN HEAD & BROWN & SHARPE SPINDLE SWING 36" dia.

Write for full particulars



SNELL TOOL & ENGINEERING COMPANY
1439 West 9th Street, Cleveland, Ohio

NEW 3 Phase B. B. Motors ½ to 25 H. P., 5 H. P. $55.75

DRILLS
20" Lever, Wheel & Lever and Power Feed.
24" and 28" sliding head, back gear, power feed.
4 spindle Foote-Burt, heavy duty.
32" Hoefer sliding head, new.
17" and 14" Delta, new.
1, 2 and 4 spindle high speed 8' overhang.
5' Bausch Radial Drill.
59 other drills of various sizes and types.

MISCELLANEOUS
Brake, Robinson, toggle, 5'.
Brakes, 6' and 10' for 18 gauge.
Grinders, cutter and cylindrical, plain and univ.
Grinders, Bryant deep hole chucking.
Broaching Machines, No. 1 and No. 3 LaPointe.
Lathe, 24"x16' Greaves & Klusman.
Lathe, 28"x20'. 6" Rahn Carpenter, with rais. blocks.
Milling Machine, U.S., hand.
Milling Machine, 20"x20"x8' Ingersoll Slab, m. d.
National Acme Automatics Nos. 52, 53 and 55.
Planer, 24"x24"x5' Hamilton.
Shaper, 24" G & E. back geared crank.
Turret Lathe, No. 4 Bardons & Oliver, chuck. equip.
Turret Lathe, 2¼" J. & L., cross slide head.
MOTORS, REBUILT 3 Phase ½ to 50 HP various speeds.

This is only a partial list of our large stock, which is constantly changing. Write for what you need.

THE OSBORNE & SEXTON MCHY. CO., Dept. H. COLUMBUS, OHIO

SIGNIFICANT USED MACHINE TOOLS

FOR YOUR SHOPS—

FOR SHIPMENT

IMMEDIATELY

PLANER, 10-ft. wide x 10-ft. high x 30-ft. long 4 hds.; belt
motor-drive, "Niles Tool Works"
PLANER, 60"x60"x30', "G.A. Gray Co's.," 4 hds.; Rev. m
PLANER, 48"x48"x12', "Woodw. & P.," 4 hds.; Belt. m. d
MILLING MACHINE, Vert. No. 3, "Cinc."; grd. hd.; s.p.
MILLING MACHINE, Univ., "B. & S.," No. 4; univ. hea
and tailstock; c-shaft
MILLING MACHINE, Pl., "Cinc.," No. 2; vert. att.; c-sha
MILLING MACHINE, Planer-type; 42"x42"x8'; "B-M," 4 h
GEAR PLANER, 16-ft. cap'y.; spur gears, extl. and int
"Gleason," Automatic, arranged for motor drive
GEAR CUTTER, 36" diam. spur gears; "G.&E.; arr. for m.
LATHE, 42" swing, 20' bed, heavy, "Niles," triple gear
LATHE, 42" swing, for car wheels, "N-B-P," dbl. hd., m.
LATHE, 42" swing, for banding or arm. turn.; "Peerless"
LATHE, 38-60" swing, Slid. Bed Gap Lathe, "Harrington
LATHE, 60" swing, "New Haven," 20' bed, triple geared
HORIZONTAL CYL. BORER, 12" diam. bar, "Niles," m. d
HORIZONTAL CYL. BORER, 5" diam. bar., "Barrett," m.
PIPE MACHINE, 8" cap'y., "Jarecki," motor drive
PIPE MACHINE, 10" cap'y., "Standard," motor drive
FORGING PRESS, Steam Hyd., 500-tons cap'y., "Unite
Engineering & Fdy. Co."
FLANGING PRESS, 450-ton, "R. D. Wood Company's"
BOLT THREADER, 2" cap'y., "National"
BULLDOZER, "Ajax," No. 8, motor driven
BULLDOZER, "Williams & White," No. 9, motor drive
PUNCH & SHEAR, 60" thr., "Hilles & Jones," single en
interchangeable; arr. for motor
PUNCH & SHEAR, 48" throat, "Southwark," single end; i
terchangeable; arr. for motor
PUNCH & SHEAR, 25" throat, "Beatty"; single end; inte
changeable; arr. for motor
PUNCH & SHEAR, 15" throat, "Williams & White", No. 1
arr. for motor
PUNCH & SHEAR, 15" throat, "Beatty." Two machine
available. Single end; interchangeable; arr. for motor
UPSETTING & FORGING MACHINES, 4" "National," al
4" "Ajax"
UPSETTING & FORGING MACHINES, 2" "Acme," also 1½
STEAM HAMMERS, 1100-lbs. and 250-lbs., Single Fram
steam or air
ACCUMULATOR, "Southw." Hyd., ram 15" diam., 15' l
LOCOMOTIVE CRANE, "American," 12½-tons at 12' r
dius; oil fired boiler
NEW—THREAD. MCHS., "Modern" cap'y. ¼" to ¾"
straight thread, and ⅛" to ⅜" pipe thread; q.c.; ma
length thread 7¾"; hole thru spindle 13/16"; 9 avai
(4) sgl. spdl. and (5) double spindle; belt or motor d

**Latest complete list of everything now being printed o
big broadside—soon off the press—WRITE for your cop**

McCABE & SHEERAN MACHINERY CORPORATION

50 Church St., New York

AUTOMATICS

2' Model A Cleveland, completely motor driven with 220 volt, 3 phase, 60 cycle motors, (12).

CUTTER GRINDER

Ohio universal, motor driven, 220 volt, 3 phase, 60 cycle motor.

MILLING MACHINE

No. 2½ Rockford plain, motor driven, 220 volt, 3 phase, 60 cycle, dividing head, swivel vise, arbors, etc.

●

Superior Steel Products, Inc.

Cleveland & Mound Sts., Muncie, Ind.

Automatics No. 2 Brown & Sharpe
Boring Mill 42" Niles Vertical S.P.D.
Drill Presses 4 sp. Leland-Gifford, 4 sp. Barnes Camelback
Grinders No. 27 Gardner B.B. op. Discs M.D.
Lathes 12x5 Hendey M.D.
Lathes 8" Sundstrand Stub
Lathes 42"x20' Wickes Grd. Head M.D.
Lathes 27"x16' Lodge & Shipley M.D.
Lathes 16x8 Bradford Grd. Head M.D.
Lathes 18x8 Whitcomb Blaisdell Geared Hd.
Miller 2B K & T Plain S.P.D.
Miller No. 3 Van Norman Duplex
Miller No. 2 Cleveland Univ. M.D.
Miller 6x48 Pratt & Whitney Thread
Punch Presses double crank and O. B. I.
Radial 4 ft. Ryerson S.P.D.
Shears 3 ft. 4 ft. 5 ft. Niagara
Shapers 3¼" Rhodes Slotter
Shapers 16" Whipp B. G. M.D.
Shapers 24" Steptoe S.P.D.
Shapers 28" American S.P.D.
Shapers 32" Cincinnati M.D. Rapid Traverse
Turret Lathes 2A & 3A W. & Swasey
Turret Lathes 21" Gisholt
Wire Straightener ¼" Shuster M.D.

VICTOR Machinery, Co.

130-132 South Clinton St., Chicago, Ill.

LATHES
27"x14' Lodge & Shipley
24"x12' Boye & Emmes
20"x10' Boye & Emmes
18"x12' Hendey
16"x8' Lodge & Shipley
15"x6' South Bend

TURRET LATHES
1" Dreses Wire Feed
2 5/16" Foster Wire Feed
20" Swing P. & W. Geared Head

MILLING MACHINES
2—No. 1½ Rockford Plain
No. 1 B. & S. Universal

SHAPERS
16" Cincinnati
20" Steptoe

DRILLS
3' Cincinnati Bickford Rad.
Barnes Hor. Drilling & Boring Machine
Binsee Hor. Drilling & Boring Machine

MISCELLANEOUS
No. 0 Buffalo Angle Bending Roll
15 Ton Lucas Forc. Press

McBRIDE & McCLENNEN *Since 1919*

Trading As

DELTA EQUIPMENT CO. **148 N. Third St., Philadelphia, Pa.**

GET IMMEDIATE DELIVERY. SAVE MONEY

on Screw Machine and Automatic Tools

Just Received 10,000 Recessing and Floating Holders, Box Tools, Collets and Posts for Cleveland, B. & S., B. & O. and Warner & Swasey Automatics and Screw Machines. For Working Stock from 1" to 8".

Over 150 Die Heads and Collapsible Taps. No Lists Available. We Suggest You Send Your Man To Select On The Spot. Priced Right.

DE WITT TOOL CO., Inc.

248 CENTRAL AVENUE **NEWARK, N. J.**

COME AND SEE DETROIT'S FINEST REBUILDING SHOP

Had to acquire 6000 feet more, Modern, single story Building devoted entirely to Rebuilding and Modernizing our own and Customers' Machines.

If you have machine tools which you would like rebuilt, a phone call or wire will bring our representative to your plant to give an estimate.

SEE THESE MACHINES IN OUR WAREHOUSE

AUTOMATICS
Hayden ¾" 5-spindle
⅞" Model B Cleveland (2)
No. 515 National Acme (2)
No. 52 National Acme (2)

DRILLS
Allen 6-spindle 14" M.D.
24" Sibley & Ware
4-spindle Reed
4-spindle Woodward & Rog.
No. 33 Radial, bench model
10" Excelsior
20" Barnes
20" Superior
½" Commander Electric
½" Utility, Electric
20" Silver
14" Meyers
14" Barnes
24" Aurora
Natco Minister, Multiple
24" Sibley, single spindle
3' Carlton Radial (2) sensitive
3' American Radial (2) sens.
Weigle Vertical 1 spindle (3)
No. 2 Foote-Burt Rail 6-spdl.
Bausch Multiple, 8-spindle

GRINDERS
6x32 Norton Plain
No. 2 Cincinnati Plain
No. 2 Brown & Sharpe Surf.
10"x36" Norton Plain Cyl.
Thompson Universal
No. 60 Heald Internal
Wilmarth & Morman Surface

LATHES
58"x22' Fitchburg
12"x4 American 47AP Bench
14" Hamilton LCG
26"x10' Bridgeford
12"x5' Sheldon (new)
14"x5' LeBlond Production (2)
14"x6' American, mtr. in base
14"x6' Lodge & Shipley QCG
14"x7' Davis, QCG MD.
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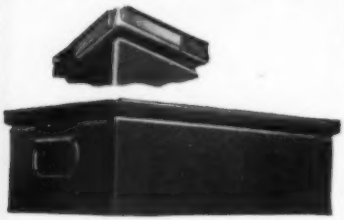

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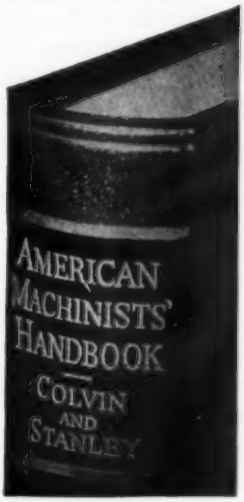

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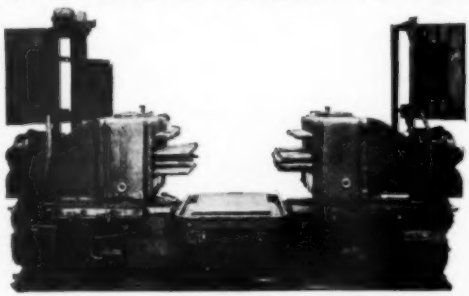

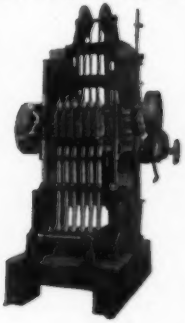

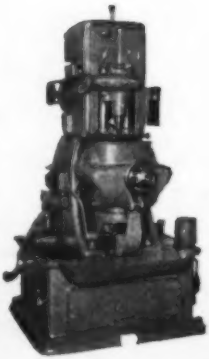

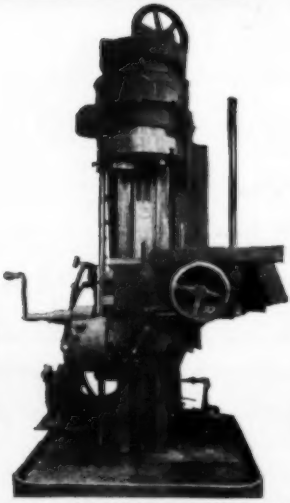

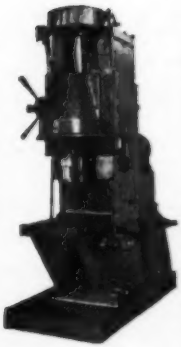

COMPLETE DESCRIPTIONS AND PHOTOS OF THESE AND OTHER MACHINES ARE YOURS ON REQUEST

LOUIS E. EMERMAN & CO.

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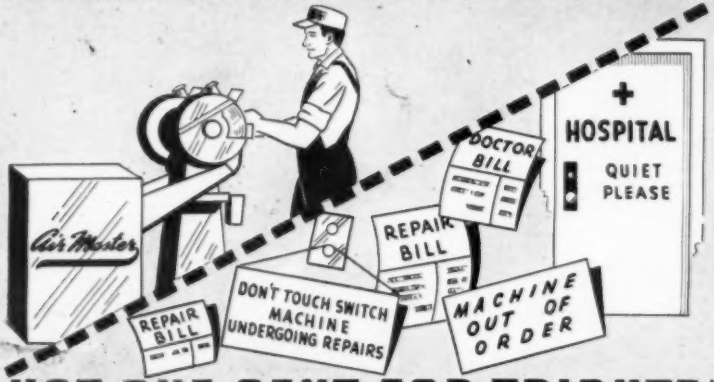

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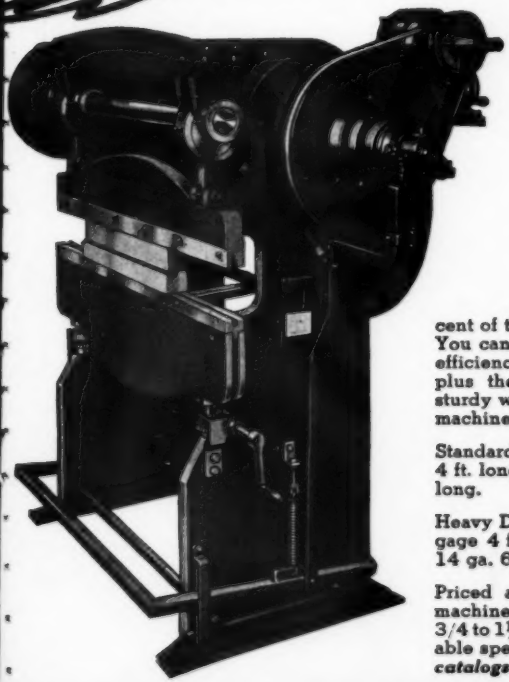

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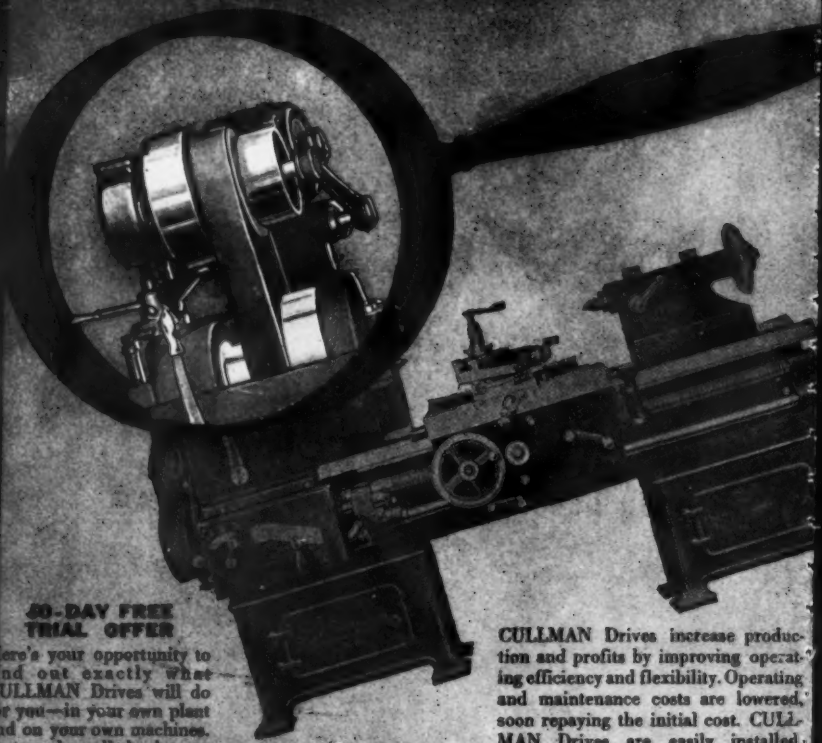

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